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Qui mare fluctisonum sulcat, curvisque carinis
Admovet externas vaga per commercia gentes,
Non ignota illi divina potentia, nec quæ
Monstrat in immenso miracula sæpe profundo.

BY ANDREW SIMPSON, SURGEON.

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LONDON.

1820.

TO

THE RIGHT HONOURABLE

GEORGE, EARL OF GALLOWAY, K. T.

LORD LIEUTENANT OF WIGTONSHIRE,

VICE-ADMIRAL OF THE BLUE,

&c. &c.

THIS WORK

IS

MOST RESPECTFULLY DEDICATED

BY

HIS LORDSHIP'S

MOST HUMBLE, MOST GRATEFUL,

AND

MOST FAITHFUL SERVANT,

THE AUTHOR.

PREFACE.

A VENERABLE author has made the following statement: "Navigation, perfected as it is at the present hour, opens all the maritime regions of the world to the knowledge of mankind; but in the early ages, personal intercourse was impracticable; the communication by sea was unexplored, and travelling by land was precluded by insecurity." In proportion, therefore, to the enlargement of navigation, it has gradually become a consideration of more remarkable and interesting importance. It has become more and more important from the augmented proportion of value embarked, from the increased number of human beings requisite to its management, and from the instinctive propensity in the human race, in whatever situation, to preserve health as long as possible unimpaired. The last consideration, even when singularly contemplated, must be deemed of such high importance, as demanding, amongst all nations employed in navigation, the greatest attention. From these and such reflections, the Author of the following work has adventured to cast his mite into the treasury.

Comprehensiveness of design, and a view to serviceableness, have been leading considerations in the following disquisitions. The fundamental points which are contemplated, whatever the value of the discussions may be, are of incalculable importance in the natural history and welfare of mankind. The common nature of the subjects of animadversion, has probably prevented that attention to them, in all their dispositions and influences, which appears to be so necessary. The generality of the principles and of their operative influence, seems to be an additional confirmation of their irresistible importance. The prolonged impression of external objects frequently lessens their operation on the power of sense, and thus, not uncommonly, after some time it becomes a consideration of indifference. It is in this manner that many of the most common and generally diffused objects in nature pass unheeded or disregarded; and because they are not ascertained in their properties nor discovered in their operations, they continue as things not deserving any attention.

Some of the subjects of the following disquisition are of this description, and have been too long slighted in the attempts for preserving the health of the seafaring. The supporting and regulating principles are of fundamental importance, but they have not been viewed as of such extensive efficacy in the welfare of man as they should have been considered in the conservative administration. The prevention of mischief,—not the fluttering, unmeaning, and indecisive attempts of removing it when actually incurred, is the principal intention of the subsequent investigations. By inattention to this consideration, diseases, with all their accompanying inconveniences and incapacitating consequences, have been too commonly predominating. The intelligent examination of such discussions as the following, will, it is concluded, introduce a conviction of their importance and usefulness. As will be found repeatedly stated in the body of the work, the considerations propounded are, if duly appreciated, of the highest moment; and if they had been properly understood in the performance of navigation, and in emigrations from one country to another, much distress and mortality might have been prevented. This is not a presumptuous and speculative opinion, but it is a reasonable conclusion, and naturally and absolutely fixed beyond all contradiction.

Disease once introduced and predominant, hath been the chief object of the marine medical officer's business; but a fundamental and illuminated contemplation of those circumstances, the management and regulation of which should have constituted the prime points of his employment and endeavours in the Prophylactical Administration, hath commonly been disregarded. Negligence in matters which are of constant moment to man, hath been productive of extensively felt inconvenience. Amongst the seafaring, *Disease* has been thus allowed to assume possession, and after the adversary hath thus been permitted to obtain full dominion, he hath commonly been oppugned on terms very disadvantageous. The prudential mode of conduct would have been, to watch the prelusive movements of the enemy, and to shorten the conflict by the speediness of his disappointment. Inattention to such a rational and commendable plan, has laid the foundation of much difficulty and suffering in all the stages of navigation.

The humble attempts in the following pages are made with the view of explaining some Elementary Principles, radically and essentially concerned in the leading intentions of prophylactical administration. In no treatise relating to the health or diseases of seamen, hath so much information upon these points been ever introduced. This is not announced through ostentation, but through laborious attention to objects of such mighty influence, and through a persuasion that these subjects have never been sufficiently estimated, in endeavours calculated for the Preservation of Healthiness. The Author did not acquire his information in peaceful retirement;—it is in a considerable proportion the offspring of corporeal exposure and mental exertion; and he may with some justice and honesty declare himself in the language of the Μεγας Αποϛολος Εθνικῶν·—Ὁδοιπορίαις πολλακις, κινδυνοις ποταμῶν, κινδυνοις λῃστῶν, κινδυνοις ἐκ γένους, κινδύνοις ἐξ ἐθνῶν, κινδυνοις ἐν πολει, κινδυνοις· ἐν ερημίᾳ, κινδυνοις ἐν θαλάσσῃ, κινδυνοις ἐν ψευδαδέλφοις· Ἐν κόπῳ και μοχθῳ, ἐν αγρυπνίαις πολλάκις, εν λιμῷ και δίψει·—The observations are made from nature, and the conclusions drawn from experience, which must be infinitely preferable to all hypothetical animadversions.

In the course of the Work occasional authorities are cited: this is performed, not from want of personally collected information, but as constituting collateral testimony and affirmative illustration. This is adjudged to be of still higher moment, in as much as these quotations have been made from authors who were, or should have been, thoroughly acquainted with the subjects on which they have attempted to communicate information. This was deemed more adviseable than to introduce the whole matter as if the exclusive birthright of personal observation and experience. The confirmation of points of real usefulness is considered as highly requisite, and especially when this is further strengthened by concurring authorities. The evidence hitherto produced by most authors seems to have a particular reference to the painful *existence* and *operation* of disease, and to the common occurrences which are the apparent causes of indisposition. Their contemplation, however, hath generally been removed some steps from those primitive and elementary views, which should have been the regulating considerations in constituting the groundwork of all investigations, determinately applicable to the Preservation of Healthiness. The views hitherto entertained upon these subjects have been too confined, and consequently, many things conducive either to the maintenance of healthiness or to the introduction of distempers, have been overlooked or disregarded.

The field of discussion is ample and rugged, and the Author cannot reasonably suppose that it is in his power to render that justice to the different heads of disquisition, of which they are naturally and eminently deserving. The importance of the general subject has been recognised, in all ages and countries in which there has been a dependance upon navigation for commerce, protection, or subsistence. Of the high estimation in which the success of navigation has been held, the following forms a remarkable illustration. It is mentioned expressly that when Alexander entered the Province (Gadrosia), it was his intention to proceed along the coast, to examine what harbours it afforded, to sink wells, and provide whatever else might furnish accommodation to the fleet; but he soon found that, from the nature of the country, this was impracticable. He sent down Thôas, however, with a small body of horse to make observations, which amounted to no more than a confirmation of the misery of the few inhabitants to be found there; and that even water, which was scarce, was brackish also, and obtained only by opening pits in the sand or beach. The army, therefore, was obliged to advance inland; and here the length of the marches to reach water harassed the men and killed the beasts. It happened, however, that at one station he met with a supply of corn, and this, notwithstanding his own wants, he destined for the support of the fleet, fixing his seal upon it, and ordering it to be conveyed down to the coast: but distress prevailed over the fear of punishment; the escort broke open the seal, and supported their own lives by the supply entrusted to their charge. Neither did Alexander, knowing their sufferings, consider this a time to punish their offence. He made a second attempt, by sending down Crêtheus with another supply of no great importance, and a third when he despatched Têlephus with a small quantity of corn ready ground, having previously directed the natives in the upper provinces to collect dates, sheep, or even salt provisions, *if by any means the preservation of the fleet could be effected.*

Although the fleet which Admiral Nearchus commanded from Nicæa on the Indus, to the Pasitigris in Susiana, consisted only of small vessels, (the largest, perhaps, a Πεντηκόντερος, or vessel of fifty oars,) propelled by oars, yet in its preservation Alexander was deeply interested; but whether this proceeded from principles of humanity, or from the impulsive influence of vainglory, is not determinable. When the interview betwixt him and Nearchus, at the end of the voyage, is contemplated, the king's satisfaction at the safety of the fleet is seemingly confirmed. Arrian, Strabo, Plutarch, and Curtius, do not condescend upon a name to the town where the interview took place; Diodôrus Siculus determines it at Salmûs, and subjoins that Nearchus, arriving when the king was in the theatre, and exhibiting games to the army, he was introduced upon the stage, and requested to relate his account of the voyage to the assembly.—The joy was now universal through the army; a solemn sacrifice was proclaimed in honour of Jupiter the Preserver, of Hercules, of Apollo the averter of destruction, of Neptune, and of every deity of the ocean. The importance attached to Nearchus's voyage, in the estimation of Alexander, is further strengthened by this annunciation. While the monarch was engaged in a conversation, Nearchus and his attendants arrived. It was with some difficulty that the king discovered who they were, under the modification and disguisement of their appearance; and these circumstances led to the confirmation of his misapprehension, concluding that both their persons and dress bespoke shipwreck and the destruction of the fleet. Alexander, however, held out his hand to the Admiral, and led him aside from his guards and attendants, but unable to utter a word; as soon as they were alone, he burst into tears, and wept for a considerable time; till at length recovering in some degree his composure, " Nearchus," says he, " I feel some satisfaction in finding that you and Archias have escaped; but tell me where, and in what manner did my fleet and my people perish?" " Your fleet," replied Nearchus, " is all safe, your people are safe, and we are come to bring you the account of their preservation." Tears, but from a different emotion, now fell much faster from his eyes; " Where, then, are my ships?" says he. " At the Anamis," replied Nearchus: " all safe on shore, and preparing for the completion of their voyage." " By the Libyan Ammon, and the Jupiter of Greece, I swear to you," rejoined the king, " that I am more happy at receiving this intelligence, than in being the conqueror of all Asia; for I should have considered the loss of my fleet, and the failure of this expedition, as a counterbalance to all the glory I have acquired." The fulfilment of an undertaking, which no doubt was deemed by Alexander as unparalleled, would greatly heighten the gratification which he received from the performance. With the exception of the interview of Joseph and his brethren, that which took place betwixt Alexander and his Admiral is probably the most interesting and affecting, of any contained in the records of Antiquity.

If this is a true statement in relation to some of the circumstances of ancient navigation, how great must the importance of the subject be, when modern navigation is contemplated; and this conclusion is applicable, whether it may be conducted for the purposes of commerce, or for those of belligerent disposition, or even for those of subsistence. So much will be said on the subject in the Introduction, that here it seems unnecessary to enter upon it by way of anticipated illustration. The following authoritative considerations, however, may be introduced as elucidating and corroborating the subject under animadversion. It is not the existence of Commercial enterprises only, that is sufficient; the relative conditions of some nations, moreover, require that a Naval Power be maintained for the protection of these commercial undertakings: and this consideration has led to the necessity of supporting vessels destined to the purposes of defence. The propriety and necessity of this mode of defensive contrivance, seems to have been long admitted amongst the British. This statement will be confirmed by the following extract from Trokmorton's Letter to the enlightened Secretary Cecil, dated from Amboise, April 28th, 1560. "In any wise, Mr. Secretary, bend your force, credit, and device, to maintain and increase your navy by all the means you can possible; for in this time, considering all circumstances, it is the flower of England's garland. Animate and cherish as many as you can to serve by sea. Let them neither want good deeds nor good words. It is your best, and best cheap defence, and most redoubted of your enemies, and doubtful friends.—There are not so many perils in it as there is to depend upon fortresses, neither the charges be like. Surely it is so necessary at this time to increase it and preserve it, as rather than fail, immunities and privileges are to be granted to those that serve in that kind of service, even like as those wise and politic governors did grant prerogatives in England, to the plough and ploughmen long ago, when the realm was desert and unlaboured."

At the time when he wrote, the difference betwixt the fleet or navy to which he alludes, and the British navy of 1814, is perhaps as great as that betwixt the navy of 1560, and that flotilla of boats for the safety of which Alexander was so keenly concerned. As a bulwark of defence, the British Navy hath been held in high estimation. The subsequent citation from a late respectable jurisconsult will bear testimony to this declaration. " The royal navy of England hath ever been its greatest defence and ornament; it is its ancient natural strength; the floating bulwark of the island; an army, from which, however strong and powerful, no danger can ever be apprehended to liberty: and accordingly it has been assiduously cultivated, even from the earliest ages. To so much perfection was our naval reputation arrived in the twelfth century, that the code of maritime laws, which are called the laws of Oleron, and are received by all nations in Europe as the ground and substruction of all their marine constitutions, was confessedly compiled by our king Richard the First, at the isle of Oleron on the coast of France, then part of the possessions of the crown of England. And yet, so vastly inferior were our ancestors in this point to the present age, that even in the maritime reign of queen Elizabeth, Sir Edward Coke thinks it matter of boast, that the royal navy of England then consisted of *three and thirty* ships. The present condition of our marine is in great measure owing to the salutary provisions of the statutes, called the navigation acts; whereby the constant increase of English shipping and seamen was not only encouraged, but rendered unavoidably necessary." This statement scarcely needs a commentary. Any person interested in the welfare of his native country, must be sufficiently acquainted with the prodigious augmentation of Naval Power, when he compares the thirty-three ships of Elizabeth with the British Navy in the course of the last warfare, amounting to more than a thousand; or about as many as queen Elizabeth's navy multiplied upon itself, and the actual strength, perhaps, increased in more than a corresponding proportion. The importance and extensive application of this proposition, requires, here, no further animadversion.

> Happy Britannia! see, thy crowded ports,
> Where rising masts an endless prospect yield,
> With labour burn; and echo to the shouts
> Of hurried sailor, as he hearty waves
> His last adieu; and loosening every sheet,
> Resigns the spreading vessel to the wind.

The discussions in this volume may, peradventure, appear to some as insignificant, or at best, comparatively unimportant; nevertheless, whatever the conclusions of the ungenerous and uninformed may be, it appears allowable to state, that the whole are the offspring of considerable expense of thought and closeness of meditation.—In the Introductory Disquisitions, various points of interesting importance to the seafaring are shortly examined, and several remarks are brought forward, which cannot so consistently be afterwards introduced. In the observations on the Atmosphere, &c. many things of general interest to mankind are investigated, and as these are of largely diffused influence, and powerfully, although imperceptibly operative, the disquisitions upon them are rather extensive. The considerations on Alimentary Supplies, as being of singular moment to the seafaring, are also extended to a considerable length; this has taken place solely from motives of usefulness. Clothing is another subject which has undergone a pretty full examination; and many rules are suggested for its suitable management. Cleanliness, accommodation, &c. as being serviceable, not only to the comfort but to the welfare of mankind, have been examined and explained with some attention. The concluding chapter may be considered as a compendium, collective of the spirit of some of the chief hints contained in the body of the work, and also as comprehending a few considerations on prophylactical administration. These consequential animadversions, from the extent of the previous subjects of discussion, are necessarily compendious, and, therefore, insufficiently illustrated.

The last chapter may be considered as a link subsisting betwixt the *Disquisitions* on the *General Principles* contained in, and forming the groundwork of, this Publication, and the *Natural History, Treatment,* &c. of distempers. It contains some observations which, if properly understood and regarded in the application and management of the means which may be serviceable to the Preservation of Healthiness, may be unexpectedly advantageous. The size of the volume precludes an extended discussion of some points and subjects of indispensable and commanding importance. Although the subject, to those unaccustomed or inexperienced, will at first sight seem extensive, embarrassed, and not improbably disagreeable; nevertheless, the philosophical and illuminated practitioner will, by virtue of his knowledge of general principles, and a readiness in associating and employing all the means calculated to aid his conservative endeavours, advance and manage with unshaken confidence and propriety, and will ultimately have the pleasure of seeing his labours crowned with success.—The cause of humanity, the interests of his country, which should be ever dear to the humane and patriotic, demand a cheerful and faithful attention to all the following, and many other considerations which might be introduced.

In succession to the finishing chapter, an ample field comes to view, the very contemplation of which, would intimidate even an adventurous individual. A chasm continues to be filled up, betwixt the subsequent rudimental, and extensively applicable observations and instructions for the *Prevention* of *Disease,* and those regulations and instructions which *may* be applicable to the treatment of *Distempers* when *absolutely subsisting.* An extensive field, therefore, remains to be cultivated, which would require much attention, labour, and patience to accomplish. Along with the subsequent admonitions and instructions, the occasional application of medicinal assistance, either for the depulsion of indisposition threatening, or for the regulation of the state of health of valetudinarians, &c. will be commendable, and will frequently, if judiciously administered, be serviceable. The natural history of disease, as commonly originating and subsisting amongst the seafaring, and also their disorders as modifiable by what is commonly called climate, by exposure, by their dietetical supplies, and by innumerable other accompanying circumstances, are considerations, which the Author would earnestly recommend to the attention of Medical Officers engaged in the Public Service of their Country. By such discreet conduct they will exonerate their own consciences, discharge a rational and humane service to their fellow-creatures, and befriend their native country; which are surely arguments conducive to perseverance.

Some points of moment remain to be discussed, such as the suitable adaptation of remedial assistance for the subversion, shortening, or mitigation of indisposition which, in some circumstances, may not necessarily lead to confinement. The choice of medicines for such purposes, is even a consideration of remarkable importance. The selection of medicines for different climates is, likeways, a matter interesting to the practitioner, and if not duly regarded, will occasionally lead to disappointment. An example in point occurs in the Peruvian Bark, in a situation where agues are expected. This article, when destined for distant places, should be carried out in the entire state, should be of perfect quality, and afterwards reduced to powder as occasion may require.—By early attention to beginning diseases, much good may be done, and positive mischief prevented. Some considerations relative to the collateral assistance obtainable from judiciously applied medicinal efficiency, in company with the subsequent instructions, might constitute the materials of another chapter, but what follows must suffice for the present.

In the mean time, the Author would be inclined to consider his feeble labours as so far independent of any posterior or subsequent discussions, on what may strictly be called the state of disease, which is a subject here not intended. It is a subject both extensive and difficult, and, likeways, presupposes the existence of mischiefs which it is the aim of this treatise, as far as possible, to contravene.—For the imperfections and improprieties of his phraseology, the Author craves forgiveness of the intelligent and the instructed. The few literal errors which may occur in the work cannot affect the sense, and seem not to require a specifical enumeration. On page 127, for אך read אר; as this is a mistake in a radical word, it is thought proper that it should be corrected. The Author would conclude by stating, that those who are inclined to do him and his work justice, must peruse the latter with attention; without this precaution, the end intended will not be obtained.—The expanse gone over, and the field contemplated at a distance, (the latter of which the Author will probably never adventure,) are of great amplitude and importance, and naturally imply much difficulty, and for their full discussion comprehend almost boundless diversity of consideration; and, therefore, it may well be said concerning the subject in general, what was pronounced on another occasion. "Res enim nulla est, de qua tanto opere non solùm indocti, sed etiam docti dissentiant: quorum opiniones cùm tam variæ sint tamque inter se dissidentes; alterum profectò fieri potest, ut earum nul-

la, alterum certe non potest, ut plus unâ vera sit. Qua quidem in caussa et benevolos objurgatores placare, et invidos vituperatores confutare possumus, ut alteros reprehendisse pœniteat, alteri didicisse se gaudeant. *Nam qui admonent amicè docendi sunt: qui inimicè insectantur repellendi.* Quicquid enim magnam utilitatem generi adferret humano, id non sine divina bonitate," scilicet hic *patria bonitate,* " erga homines fieri arbitrabantur."

Glasgow, March, 1820.

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INTRODUCTORY DISQUISITIONS.

EXPOSITION
OF
ELEMENTARY PRINCIPLES
SPECIALLY CONCERNED
IN
The Preservation of Healthiness
OF
MARINERS, *&c.*

CHAPTER FIRST.

INTRODUCTORY DISQUISITIONS.

—"Ventis animam committe dolato, confisus ligno, digitis a morte remotus, quatuor aut septem, si sit latissima taeda."

1. An historical statement of the beginning and progress of navigation, including all its advantages and misfortunes; constitutes no intentional and immediate part of this undertaking. In possession of a resemblance to all other human contrivances and adventures, it has, almost imperceptibly, but successively, undergone progressive improvement; and occasionally been intercepted by unexpected retardations and calamities. A retrospective consideration of humankind, introduces upon the superficies contemplated, the appearance of rudeness and simplicity in all their machinations, which now, amongst the more polished nations, have almost universally disappeared. Whether the complexness and nume-

rousness of modern schemes and formations may have been equalled by their usefulness and convenience, is not peremptorily determinable. They are certainly the offspring of amazing mental labour and corporeal industry; and if not proportionately advantageous, they are undoubtedly indicative of the previously inconceivable capability of intellectual application.

II. Mankind have, in all probability, been prompted to invention by two predominating considerations; the inflexibility of necessitude, and the prospect of advantage. The usefulness of any proposition, which has not been experienced, can only be theoretically anticipated; the consequences awaited, therefore, are exceedingly problematical; but man possesses interminable perseverance; and this attributive qualification, corroborated by intellectual discernment and application; and consequently conforming observation and experience, are some of his most distinguishing characteristics. The first attempt of man, designedly for supporting and preserving himself on the aqueous surface; as illustrated by authentic confirmation, was undertaken by supernatural appointment.

III. It may be considered a reasonable determination, that the primitive destination of mankind was exclusive subsistence upon the terrestrial superfice. This mode of life appears more congenial to his nature and acceptable to his constitution. In the protension and diffusion of population, however, or even in their emigrations from one country to another; (for in compliance with an original command, mankind appear to have been virtually obedient to the injunction thereby conveyed, especially, "be fruitful and multiply,") rivers, lakes, &c. might intervene; and these, with the intention of shortening their course, might be passed upon rates or rafts; or the monoxulon, or canoe, in some regions a hodiernal emblem of simplicity; might be employed as rather inconvenient instruments for their transportation. Subsistence, and probably, commercial speculations, would, also, be powerfully operative incitements to mankind for originally attempting navigation. Embarcation, upon some of the forementioned contrivances, for the purposes of fishing in pools and lakes, and along the sea shore; would be one of the first modes of sailing which they would undertake. Emboldened and instructed by experience, in more confined attempts; they would gradually both improve their vessels, and also extend their aquatic excursions.

IV. The progressive developement of navigation, in all its contingencies and consequences, is, *mutatis mutandis*, not remarkably dissimilar to that of the human mind, in the advancement of scientifical investigation. Philosophy is unnecessary for the apprehension of the difference subsisting betwixt a Grecian monoxulon and a British first-rate. The dissimilitude and disproportion are so remarkable, that even the eye of inexperience would immediately institute a discrimination; and thus, that there is an incomparable disproportion between the improvement and accomplishment of ancient and modern navigation, is the allowable and applicable conclusion. The moderns, however, it will be instantly observable, are in possession of advantages which to the ancients were altogether unknown. The compass, a fortuitous, but beneficial discovery, and the improvement of instruments for astronomical observations, have been, and are, to the former of incalculable importance, in their progressive improvement.

v. A description of the ancient navigation (as just said) would be inconsistent and irrelevant; and what is peculiarly to the purpose, their voyagings and adventures are now so involved in fabulous obscurity, in such inscrutable darkness, that comparatively only a few of their circumstances are intelligible. The consequences of their marine expeditions, if such they may be denominated? are commonly undescribed, or so unintelligibly communicated, as not to afford to the investigator either much information or amusement. But it is reasonable to conclude, from the shortness of their trips, and their occasional visitations of the shore or coast, and the obtainment of fresh water, provisions, &c. that they were rarely, or never, liable to the troublesome inconveniences, and formidable complaints, which are now, even in the meliorated condition of navigation, so frequently and injuriously predominating. The most prolonged, and also the most interesting voyage of antiquity; a description of which has outlived the devastating progress of time, and other overwhelming circumstances, is that of Nearchus, Alexander's admiral, from Nicæa on the Indus, to the Pasitigris in Susiana. Notwithstanding the tediousness of this voyage, and the difficulty of obtaining suitable supplies of provisions and water on the miserable coast of the Meckran, Gadrosia, &c., scorbutic complaints do not appear to have been prevalent, or reported in the journal of Nearchus. In this coasting voyage, Admiral Nearchus, with his companions, expended about twenty-one weeks, in performing a distance which could be accomplished in the seventh part of the time ; or a voyage from Britain to Indian climes might be completed as soon as that undertaken by Nearchus. This is an illustration of the remarkable difference which thus becomes conspicuous in the comparison of ancient and modern navigation.

VI. The suitableness and reasonableness of the subsequent considerations and animadversions, will be sufficiently manifest, and important in their consequences, to all who are thoroughly acquainted with the subject; animated with the friendship suggested by humanity; and interested in the protection and prosperity of their native country. The preservation of healthiness in every season, in every climate, has been continually demonstrated in the solicitous endeavours of the human species; either intentionally used for the prevention of disease, which is the most desirable; or when introduced, for its mitigation; or, what is then universally and particularly acceptable, its eradication. Ever since offence, consequent disease, and suffering, entered, the watching of nature's curative intentions, and the assistance of her favourable movements; although these were oftentimes grievously misunderstood, and consequently led to mischievous administration, have more or less occupied their attention. And if mankind are, unavoidably or necessarily, exposed to indisposition, pain and death; even in the most comfortable and favourable circumstances; how much more those who adventure themselves to the unpleasant and unpropitious occurrences on shipboard. The men who have experienced these inconveniencies; those who have commendably stood in the defence of their country; in the propagation and maintenance of its commercial undertakings, will immediately comprehend, and thoroughly appreciate, the soundness and importance of these animadversions.

VII. The aforementioned improvement and augmentation of navigation have, notwithstanding these particularly applicable considerations to some of its circumstances, not been unattended with inconveniencies, and incommoded, and oftentimes disconcerted, by mischievous consequences. In proportion to the lengthening or continuation of these voyagings, hardships, complaints, and inevitable destruction, have been frequently predominant. These disastrous and mournful occurrences, were sometimes particularly troublesome in the former periods of European navigation. In the coasting voyages of the ancients, they commonly obtained supplies from the islands or countries along which their courses were extended. They likewise had occasionally the enjoyment of being on shore, purposely for divertisement, investigation, or the obtainment of necessaries. Those transmutations of circumstances, from the unavoidable confinement and awkwardness of their ships, became to them the more particularly acceptable and beneficial.

VIII. The boldness and determination of the moderns have, in the pursuance of navigation, extensively surpassed those of their predecessors. This difference of performance, as previously insinuated; is now conveniently explicable. The ancients were not in possession of those instruments, and the advantages of astronomical observations, and calculations thereupon instituted, whereby modern navigation has opportunely got such improvements, and unsuspecting anticipation of its accomplishment. The accidental discovery of the ordinarily determinate tendency of the magnetic influence, and instrumental improvement, laid the foundation of all this invaluable superiority. An unpleasant consideration, however, intervenes,—that if the moderns have so wonderfully meliorated their vessels, and amplified the diffusion of navigation, there have been hereunto superadded numberless disadvantages, and multifarious incommoding circumstances. These unfortunate inconveniencies originate, principally, from the continuance or prolongation of their voyages; their unavoidable confinement; the state of their alimentary subsistence; and unskilfulness of management. That these evils accompany navigation, and will always be its afflictive concomitants, seems to be a proposition undeniable. As a countervailing argument against the magnitude and importance of these circumstances, so frequently happening; where navigation has been lengthened, and without the intervening assistance of any fresh provisions; it may here be remarked, that for a moderate length of time, men may enjoy as good health at sea, as in any other situation. This unaffected continuance of healthiness is, however, confessedly and necessarily, circumscribed within determinate boundaries; but even these will be commensurate with the peculiarities of constitutions, and the qualifications of other circumstances. These conclusions are veritable, and never to be overlooked; notwithstanding the favourable accounts of a few successful voyages, and which were accompanied with unaccountable, and peradventure, unprecedented healthiness.

IX. The intelligences of a few voyages having been accomplished without the intercurrence of any formidable complaints or mortality, are, when knowingly investigated, confinedly applicable statements; and form no instructive or regulating maxim in the grand system of navigation. They were the consequences of some fortuitous occurrences, and the accumulation of advantages, which are, in the ordinary state of navigation, rarely obtainable; and whose serviceableness is explicable, from the supposition of an appropriate investigation of constitutional healthiness, accompanying cleanliness and the maintenance of a salubrious dietetical administration. These latter are considerations and preparative contrivances, which, unhappily for the wretched seaman, are not continually procurable. In vessels employed for commercial purposes, circumstances of an unfavourable description, will more or less prevail; and, consequently, disability and complaint must inevitably be oftentimes troublesome. And moreover, an additional observation may here be made,—that all the improvements which might be commendable and beneficially applicable, have not hitherto been introduced. This blameable inattention to, and disregard of, what may confidently be considered expedient, and conducive to the comfort, and health, and preservation, of a useful part of mankind, have been too long the fit subjects of lamentation, and the causes of unspeakable disappointment. The tribute of gratitude, however, should continually be conferred upon those, who deservedly merit such a gratifying retribution. The British have excelled all other nations in their navigation, and every beneficial consideration therewith connected. In the Royal Navy, which, beyond comparison, is the most magnificent and powerful naval contrivance in the world, these commendable improvements and reformations only lingeringly obtained their establishment. The progress of these, however, as of every thing designed and performed by created faculty, is susceptible of irregular acceleration or retardation, and even unexpected opposition, from a multitude of circumstances, which cannot be always anticipated.

x. In the revolution of an excellently contrived machine, as long as the impelling and governing power possesses an invariable proportion of *impetus*, &c.; *cœteris paribus*, an equality of performance, will be observable. So, likeways, in the management of discipline, and every thing accommodated to the furtherance of the contrivances preservative of healthiness and regularity, steadiness, and a skillfully administered superintendence, will all be found particularly advantageous. Judicious and systematic procedure once established and authorised by confirmation; its serviceable consequences will be irrefragable encouragement to its unintermitted employment. At sea, as well as on land, cleanliness and other comfortable considerations, are of remarkable importance; but in the first situation, their observance has been only lately introduced. In the former periods of European navigation, uncleanness and confinement, with all their loathsome companions, and mischievous consequences, have been more particularly troublesome and prejudicial. And in straitened towns, cities, &c., or in incommoded vessels, these circumstances have been especially predominant and afflictive. Infectious diseases, pestilence, and the miserable aggravation of many epidemical complaints, have been the consequences.

The devastating prevalences of small pox, measles, febrile ailments, and other evils, in warlike ships and in merchantmen, are too strongly delineated upon remembrance to require a descriptive enumeration. The comparative infrequency of these distempers, with all their incommoding and disquieting concomitants, is a demonstration of the advantages procurable from the hodiernal and commendable improvements. An acknowledgment is justly due to those who have, honourably and beneficially, effectuated their attainment. Notwithstanding the laudable endeavours of the philanthropist, and patriotical kindness, every desireable amendment has not hitherto become applicable. In all merchant vessels, even in the Royal Navy, health cannot reasonably be expected constantly to continue unimpaired. The principal causes, as already hinted, are the peculiarity of their accommodation, unreasonable aggregation, or accumulation, confinement, irregular and imprudent exposition, the mode of victualling, with its unseasonable properties, and all their other numberless circumstances, in the most extensive view of consideration.

XI. The commercial and defensive state of the British empire, requires an extensive, and inevitably a promiscuous, assemblage of men for its fulfilment. And in proportion to the demand, as in all other commodities; the supply becomes diminished, and commonly the quality materially deteriorated. Positive evil is perpetually exasperated, by the occurrence of inconveniencies which are physically unavoidable: this proposition must be so intelligible to every one of the human race, in the undisturbed possession of ordinary intellect, as not to require any elaborate illustration. The gathering or collecting of those precious fellows for public service, is the first stage of a progress, which usually exhibits phenomena more readily conceived than explained. The necessary aggregation of those miserable creatures—at least this method is commonly, but most unhappily adopted—in combination with displeasing confinement, in which they are thus implicated, must at the commencement be inconceivably disagreeable. This is unfortunately productive of annoyances, which, for the public service, is probably not easily avoidable. The mode customarily employed for their detention, previously to their distribution, from considerations which may be immediately understood by all, must be deemed objectionable. A smoothness, an agreeable management, a readiness but discreetness in accommodation, no appearance of a preconcerted determination to confinement;—the supposition of these, will, with them, act as consolatory blandishments, and give the probability of unmurmuring acquiescence.

XII. As it is not the intention of this work to describe especially the diseases affecting seamen; but rather an enumeration of some things concerning them, which have not been properly investigated, or not completely understood; the consideration of them, therefore, will seldom be introduced. Observations, however, upon important points, will be occasionally propounded; but these will ordinarily relate more immediately to the subject of prevention. In the subsequent reflections, four important considerations will be investigated, and pretty amply explained; so that little concerning these need here be anticipated. And here it may be premised, that a very extensive examination of these subdivisions is not attempted: this would have led into a length of discussion altogether foreign to the present design. The Introductory Disquisitions will be principally constituted of observations more directly or obliquely connected with the life of seafaring people; including some of those circumstances whereby their health, comfort, or obtainable happiness, (small enough) may be especially and ordinarily influenced.

XIII. A primary remark is, that the life of a sailor appears, however considered, in all its difficulties, privations and dangers, peculiarly irksome and unnatural; and apparently not an original intention, but only an accidental concomitant, of man's progress through his terrestrial pilgrimage. In opposition to this statement, it may be said, that after an individual has been familiarised to a particular mode of life, or accustomed to a particular concurrence of events or impressions; their endurance is thenceforth rendered more commodious, and ultimately their tolerance a consideration of indifference; or even what is more inexplicable, a matter of acceptable employment. Man, however, it must be observed, is not immediately and conveniently conformable or proportionate to the sufferance of a contingent alteration of all his circumstances. He certainly possesses mutability in an eminent degree, whereby he is sometimes susceptible of a considerable share of assimilation. But lastingness and steadiness of continuation are qualifications determinable, and appropriated by other considerations. In the influence of every material change, there is a degree of probation, and a progressive and approximating predisposition, to its affirmation and establishment;

and this probationary and reconciling process may be wonderfully lengthened or shortened, considered tolerable or grievous; according to the particular constitutions and temperaments of individuals.

XIV. The transition from a terrene to a marine mode of life, certainly implies an alteration of considerable magnitude and importance; and the influence thus perceived, will, in some degree, be modified by the age and the previous mode of life, to which the adventurer may have been accustomed. The consequent impressions will be powerfully regulated, by the change being the offspring of voluntary submission, or the result of constraint. A mutation to a sea life, as aforesaid, will always be more remarkable and impressive than a simple change of station or occupation on shore. In the latter situation, stability, and the conception of security, generally stay and prop expectation and confidence. The apparent enjoyment of unrestrained freedom, and the occasional visitations of friendship, are individually, or collectively, favourable to sentimental or supposititious and comparative happiness, and that constitutional healthiness, of which the rural life is so frequently furnishing illustrious and acceptable exemplification.

XV. The forementioned transmission from a land to a sea life, presupposes difficulties of a different complexion; treatment with which he is heretofore unacquainted, and regulations to which he has not previously been necessitated to pay any deference or attention; and a command to which he has not before condescended to give any obedience. His youthful acquaintance have disappeared, and the companions of his amusements, or the associates of his ordinary business, are now no longer counsellors or coadjutors in his management. The strangeness of innumerable circumstances, previously inexperienced, will oftentimes be the cause of feelings and reflections which are disagreeable; even although the person suffering the change may have, while he was on land, been struggling with adversity and indigence. Nevertheless, the common, but strongly implanted principle of the love of country, the disengagement even from the supposition of absolute command, the irksomeness of confinement, and the seasonable intervention of friendship, are still with him predominating considerations. This love of safety, this disrelish of positive and occasionally rigorous command, influence even the most uninformed and unlettered; and the supposed possession of natural freedom, enlivened his resolutions, and maintained comparatively healthful composure.

XVI. A man, when he, even voluntarily, offers himself to the army or navy, it may reasonably be supposed, for the most part, if he has any delicate feelings remaining, must have the sensations of one doing some injustice and prejudice to himself. Another admissible conclusion, moreover, is, that few of the lower classes enter the public service purposely with the view of being advantageous to the commonwealth. They are almost, in the first instance, invariably under the compulsion and governance of inevitable and invincible necessity. This consideration, in the natural history of mariners, may have commonly been overlooked; but upon more particular investigation, will be found a circumstance frequently and materially productive of dispositions and propensities, hitherto almost disregarded, and consequently unexplained. These observations are made, not from an ungenerous and unfriendly principle, but from the reflection, that this peculiarity and modification of their circumstances; for some time after their embarcation, very ordinarily regulate conjointly their deportment, and also the probability of the continuance of their healthiness.

XVII. Youthful impressions, or the consequences of primitively accustomed occurrences, with their combinations and consecutive intellectual associations, are with the human kind, almost universally, the most steadfast in their establishment; and consequently, the most distinctively remembered, the most pertinacious and irremovable. This is a conclusion which has, in all ages, and in every clime, received both the approbation and confirmation of the peasant and of the philosopher. And therefore the observation has been made, that even in the decrepitude of old age, the events of childhood and adolescence have been called up with clearness, by a particular recollection, while matters of later occurrence could not be brought to remembrance. This wonderful readinesss of remembering the things of youth, will thus frequently be vigorously operative, when the remembrance of those of later and riper years have passed into the vale of irrecoverable forgetfulness. Accommodation also to the unfavourable and uncomfortable circumstances of a sea life, generally obtains its accomplishment most conveniently and thoroughly in the days of boyhood or youthfulness. All the accompanying circumstances (oftentimes troublesome) of marine life, are, at that early age, more perfectly opposed; and afterwards the endurance of difficulties becomes more familiar and tolerable. It may instantly be observed, from these insinuations, that there is here not needfully included, a reference to what can be fulfilled by physical strength exclusively; but the general doctrine is more peculiarly applicable to that youthful compliance and promptitude to specifical adaptation.

XVIII. An artificial habitude (if the expression be allowable) is gradually introduced, and obtains systematic and indelible confirmation; and thus, notwithstanding the appearance of disagreeable circumstances to the unaccustomed, yet, with those actually engaged, their mode of life gains imperceptibly a preference to all others with which they are acquainted. From these conclusions, which seem to be conformable to the ordinary principles of nature; a regulation of practical importance is lawfully deducible, (and indeed is, as far as practicable, in the public services, a matter of diligent observance,) of the early appointment of people to stations in marine service, is, generally speaking, adviseable. A certain proportion of constitutional firmness and capability, as will shortly be more pointedly explained, is always requisite. At middle age, however, if the person has been familiarized with any particular mode of life, or if he has been hackneyed in any of the distorting mechanical occupations, there are commonly superinduced a stiffness, a characteristic particularity, and irreclaimable awkwardness, which either impede or preclude the possibility of obtaining any expertness or cleverness in the performance of the duties of his department. Lubbers of this description are readily discoverable by the experienced and intelligent officer; and he must have an uncommon share of comprehension and perseverance, to reduce them even to a moderate degree of usefulness. The stubbornness of artificial formality thus becomes a superadded part of the constitution; and, after a certain stage of progression, almost inflexible, and ultimately invincible.

XIX. A person who has been produced in a part of the country remote from the sea, and especially if he has had no previous tolerable conception of its remarkable appearance; upon first approaching the shore is struck with wonder and surprise. And these emotions are more especially produced, if the expanse of aqueous surface, subjected to the inspection of the stranger's eye, be considerable. These feelings of surprise, too, are materially heightened, if, at the time of observation, the surface be in the state of restless agitation. These phænomena in some measure overpower his anticipated explanation and confidence; and, notwithstanding the grandness of the tumultuation, yet he has formed a collective resolution, from all his experience, that firmness and steadiness are emblematic of security and certainty; and, reversely, that commotion and tremulation are to him indicative of dangerous instability, with all its unfriendly concomitants. This doubtfulness and amazement are, moreover, augmented, if, at this particular conjuncture, he never has seen any of his fellow-creatures adventuring upon the mobile element. Circumstances being all favourable, and presuppose that embarcation is appointed for him; when first he commits himself to shipboard, he is fearful and watchful, and upon launching forth, he is still more intimidated. So, commonly, is the progress of human life, until assurance is strengthened by perseverance, and confidence established by the inspiration of practical knowledge.

XX. The youth, however, who has been accustomed to dabble about the sea-shore, and occasionally to adventure himself upon the undulating surface; becomes gradually emboldened in his proceedings, and deliberately accustomed to the different evolutions. In these instances, the propensity, and formative, and qualifying force of imitation, with all its influence, is peculiarly exemplified. He, in all likelihood, acquires, unperceivedly and inexplicably, even a predilection, or rather preference, to a sea-life; and, if this has been early and easily affirmed, may to him eventually become a satisfactory employment. In this exemplification, youthful compliance is supposed to predominate; and if he possesses smartness and nimbleness, skilfulness and cleverness in his new occupation may soon be acquireable. Constitutional affirmance becomes irremoveably established, in what situation soever of life man may have been placed, so that after mid age it is troublesome or impossible for him to change the habits which have thus been introduced.

XXI. As formerly remarked, the person who is somewhat advanced in life, before his proceeding to sea; is generally not so expeditely compliable with his alteration of condition, as the adscititious youth already characterised. With the former, indeed, the case appears widely different; to him almost every circumstance is unpleasant, and nearly irreconcileable; and this observation will be still more particularly applicable if he has previously been in comparative happiness. If his change has been in consequence of misfortune, and now accompanied with the irksomeness of confinement; his condition will now by himself be deemed highly disagreeable.

An inconvenience and hardship attending the impression of people of the forementioned description, into the army and navy, is, now immediately explicable. They are perhaps suddenly separated from their friends, relations, or families; and also from extrinsecals, with which they have been continually familiarized; and for all which, but chiefly, it is reasonable to suppose, the former, they have some of the storgê, or natural affection.

XXII. They are, after this disjunction of their ordinary friendships, and more immediate communion with those whom they consider worthy of some regard; plunged into the confined compass of a hulk, or ship, &c. with all their miserable circumstances. They instantly begin a comparative estimation of their present and former situation; and in calculations of this description, for reasons requiring no comment, there is generally a great share of incorrectness. Surrounding substances commonly have the strongest influence upon ignorant people; and the remembrance of past annoyances undergoes a progressive diminution, and, often ultimately an irrevocable obliteration. This obscuration indirectly operates in a twofold manner; it removes from the person's intelligence any observeable standard of comparison; and from the unmingled nature of the principal sentiment, the concomitant uneasiness, of whatsoever description, is thereby considerably exasperated: consequently, amongst the troubles and afflictions of life, vulgar estimate generally accounts the present the most desperate and intolerable. The absolute or conceivable rigidness of his situation is then rendered the prevailing theme of his meditation. This conclusion, however, is not positively exclusive; for the objects which have made impression upon his imagination, are not immediately withdrawn from recollective presentation. They, indeed, for some time constitute the foundation of his mournful reflections. The remembrance of kindness and friendship, now no longer obtainable, becomes a repeatedly intervening cause of uneasiness. And as appertaining more immediately to his actual condition, there are added to these circumstances, the idea of interminable confinement, and the incommoding apprehension, naturally engendered by the anticipation of absolute, and for ought he knows, merciless authority, the dislike of warlike discipline, and the dread of punishment.

XXIII. The aggregation or concentration of these circumstances; with multifarious others which could appear in enumeration, are unhappily contributive; among sailors inexperienced, to the production of gloominess, fearfulness, listlessness, and despondency. And when these are thus encompassed with either real or imaginary mischief, they become peculiarly obnoxious to indisposition; and if they are of a worthless disposition, would rather be ranked in a sick-list than reputed fit for their common occupation. Characters of this description, with an accumulation of numberless anomalous, but insignificant symptoms, are frequently troublesome and burdensome to themselves, perplexing and embarrassing to the practitioner in attendance; and if these circumstances are conjugated with the cunningness which some individuals have in possession; some discernment will be necessary for establishing the line of demarcation betwixt those sophisticated and unassumed. As long as they are not pointedly disobedient, or prominently offensive; moderation, with distinctive regulation, are the most commendable. This exhortation, however, is considered to be more especially applicable to those, who may at the commencement be overcome with lowness, and that silliness, and disinclination, which may occasionally be observeable, if they have been brought to service by compulsion, and their detention be apparently the effect of restraintful circumscription. These things are here mentioned, as being intimately connected with the first entry of seamen; and also, as being some of the manifold causes of disease, so frequently happening; without the evidence of adequate reason, amongst a recently collected ship's company; which is occasionally in part constituted of raw land-men.

XXIV. A sailor, after adaptation to his situation, is commonly a careless creature, and rarely distressed with troublesome solicitude. He may, however, occasionally be opposite in disposition, and then he is as thoughtful; and if he then tumbles into disease, there are few people so comfortless and despondent; and his restoration will thus ordinarily meet a proportionate impediment. These may to some appear redundant or unavailing observations; but by those who have made the most penetrating examination, and who have had the most enlightened and extensive experience amongst seafaring people, they will be deemed indisputeable. The sailor, however, and especially when of some standing; and particularly where there is a predisposition to laziness, with all its vituperable and reproachful companions; will demand acuteness in management. He is oftentimes contaminated with a baseness and wickedness of disposition, which are remarkably reprehensible. He has also too often a deceitfulness and cunningness, by which he may ingeniously and perseveringly counterbalance the management of a professional man of inexperience or inconsiderable discrimination. The sagacious and intelligent, however, will penetrate with a keenness and discernment, which defies the contravention of all dissimulation and disguisement.

XXV. In apportioning the men to their respective stations, it is perpetually and sufficiently understood, that their physical capabilities must be taken into consideration: but, for the public service, something more has been concluded to be necessary, and adopted in practice. Instructions and regulations, applicable to the choosing of seamen before embarcation, have been determined to be adviseable. In this place, however, a lengthened description would be inconsistent, and what affords a gratifying reflection, it is seemingly unnecessary. The execution of these matters must be conducted upon principles whose management is deriveable from a knowledge of humankind; calculated by many of their dependences and mutual relations, and from acuteness of professional acquirement. The ingenuity and knowledge of those who are placed for the purposes of inquisition and determination must find employment. A more extensive proportion of intelligence and professional knowledge will ordinarily be found requisite, than what may commonly be adjudged to be applicable. A commendable skilfulness, accompanied with the advantages of profitable observation and experience, should, in the practitioner, be viewed as indispensable. A certain degree of physical firmness and strength, in every individual, is proper and necessary to render him even deserving the occupancy of his cubical measure on shipboard.

XXVI. Constitutional soundness and accordant capability, and the likelihood of their continuance, are sometimes, however, difficultly ascertainable, and adequately calculable. Experience and moderate knowledge will themselves even be sometimes embarrassed, and considerably disappointed. After proportionate and enlightened investigation, however, the keen eyes of practical wisdom will seldom be deceived; and in an undertaking of this description, a distinctive knowledge of the characteristic appearances of healthiness, or, contrariwise, of inclination to complaint, will be particularly contributive to the acquisition of the desireable information. The appearance of the countenance and state of complexion, &c. are the things most remarkable upon a first interview. A considerable clearness and expressive liveliness of countenance, are signs necessarily approveable; and a brisk, lively, moist, and clear rolling eye, is one of the surest tokens of general health. The smallest degree of languor, or heaviness, without any evident reason, mistiness or cloudiness, or glossiness, or dirtiness of the eyeball, are sufficient grounds for suspicion. An unnatural sallowness or wanness, or hollowness of countenance, are appearances which are highly objectionable; and more especially if a tropical climate is the adventurer's destination. Paleness, or blueness of the lips, or of the surrounding integuments, or along the sides of the nose, or below the eyes, may be considered as expressive of incorrect health. A clean, ruddy, moist tongue, and healthy florid gums, are pleasing indications. The opposite of these, a whitish or coated tongue, flaccid or spongy gums, are commonly symptoms of an imperfect state of the constitution. Hollowness of the temples, or about the eyes, paleness, or thinness, or apparent shrinking of the ears, or if they, as frequently happens, appear inclined to be pendulous, or when they unnaturally approach the side of the head, are all forbidding phænomena. An apparently unnatural slenderness or smallness of the neck, in any point of view; or the courses of the different muscles being more than usually conspicuous, are appearances frequently declarative of constitutional imperfection, either continually subsisting or accidentally superinduced. A narrowness, a roundness, and incurvation of the shoulders, unless they may appear to be ascribable to primordial conformation, or frequently even then, are almost demonstrable and prescriptive characteristics, affirmative of premature dissolution. A changed cadence of voice from its former natural quality; without any assignable or evident reason, and depending upon a general or remotely situated cause rather than any perceptible and immediate derangement of the instruments subservient to articulation; the slender voice, "vox exilis," the tremulous voice, the "vox tremula," and the "vox cava" or hollow voice, &c. &c. are all unfavourable. Another circumstance which is appropriately and individually characteristic, and which is determinable even by the meanest capacity, is the person's universal appearance and deportment. His gait or step, including the different corporeal movements, will likeways fall properly under consideration. From these appearances alone, a very applicable conclusion may often be drawn concerning his capability and usefulness. The movements, especially those represented in progression, are oftentimes indicative of the firmness, robustness and hardihood; or oppositely, of the feebleness, debilitation or insufficiency, of the individual. A firm, easy, bold step, an erect body, commanding and regularly performable gesticulations of the different members employed in locomotion, are all agreeable and promising properties. A hobbling, an unsteady, waddling, or indecisive mode of ambulation, are, too, commonly signs of constitutional imperfection. The inspector must institute a difference between the aforesaid peculiarity, or rather contingently introduced circumstance; and the ungraceful awkwardness of motion so expressively descriptive of many seamen when they have been confirmed in their mode of life by habituation. The labouring, the balancing step, which is so frequently observeable amongst the enfeebled and toil-worn seamen; the shortened protension of the foot proceeding in advance, the quivering or tottering knees, will invariably be found to demonstrate the existence of impaired physical strength. The flaccidity and softness of the muscular substance, its tremulous or wavering movements when thrown under the regulation of command, are declarative of diminished firmness and sufficiency. The enumeration of favourable and unpropitious circumstances might be augmented; but the forementioned constitute some of the principal phænomena; from which, in combination with experience and discernment, the illuminated practitioner may deduce regulating and tolerably accurate conclusions. The definitive adjudication must be gathered from a reasonable consideration of the aggregate of the most remarkable and unpromising circumstances. A diversity of smaller remarks will be made by the accurate and informed observer, in selecting men for marine service, and need not be here particularized.

XXVII. The antecedent are some of the principal points deserving faithful observance and notification. The apparent possession of moderate health and constitutional firmness, is not exclusively satisfactory in a distinguishing investigation: the general safety requires a more scientific and careful examination. The determination or confirmation of complete exemption from the lodgement of any infectious colluvies will be particularly requisite; and, for the successful resolution of this question, professional discrimination will be conspicuously serviceable, and undoubtedly indispensable. For it should constantly be held in remembrance, that a person, apparently in the possession of moderate health, may nevertheless harbour the pabulum or rudiments of disease, and thus be a dangerous inmate with his fellows. A person, unconscious of any lurking mischief, may, without the semblance or symptoms of any defineable complaint, nevertheless communicate distemper to his neighbours. This occurrence can only be troublesome when he unknowingly has become the depository of infection; and is perhaps himself for a time unsusceptible of its declarative or specifically characteristic manifestation. Infectious diseases may thus be undesignedly, unexpectedly, and inexplicably transmitted, and imperceptibly communicated: and occasionally the person, through whose intervention the poison has been conveyed, will afterwards be subjected to the action of the mischief. People in this condition may for some time have all the appearance of soundness and healthiness, but, notwithstanding, prove prominently dangerous to those with whom they have unrestrained intercourse. This paradoxical declaration is explicable from the greater readiness of some others receiving the infectious influence, than the individual to whom the poison had been primarily communicated. Those persons who have themselves previously been sufferers, unless there has been either a long interval since the departure of their diseases or a quick revalescence; will generally be more conveniently discoverable from the peculiarity of their appearance. But here the shrewdness of the most intelligent and industrious investigation may labour under uncertainty, which is perhaps, for different reasons, not easily removeable: the difficulty of obtaining information, upon which the examinator can lay any supporting confidence, originating partly from the ignorance and partly from the person's inclination to concealment. And if the discrimination may occasionally perplex and puzzle, or even surpass the keenness of experienced intelligence; where and how shall dulness and presumptive incapacity fix their determination? This then is a consideration of the greatest importance.

XXVIII. Precaution therefore may always be considered particularly adviseable in those circumstances, in which, what may be thought a trifling inattention or oversight, will, in all probability, lay the foundation of afflictive or destructive consequences. The method therefore proposed for adoption, and which should never be neglected where there is any ground for suspicion; is, precluding all recently assembled or collected men from embarcation upon their respective vessels, until they have undergone a scrupulous purification. A detainment of them, therefore, at places specifically appointed for these purposes; until these expurgations are properly and completely performed, will be adviseable. The general welfare, the safety of ships' crews, demand these precautionary applications. The examination of their respective capabilities, comparative cleanness, healthiness, and disengagement from all signs of indisposition; or the probability of communicating any diffusible complaint, will therefore constitute the chief points of investigation.

XXIX. The ascertainment of exemption or freedom from the probability of the existence of distempered propensity, or latent evil, will fortunately not require long confinement. The cleansing or rejection (if conceived necessary) of their clothing, bedding, &c. when they are supposed to be the containers of morbific defilement, can likeways be speedily accomplished. Washing, scouring, &c. with warm water and soap; unrestrained exposure to the atmosphere, and especially when it is freest from dampness and in a state of commotion; and the application of a moderately augmented temperature, will, either in combination or succession, be found beneficial. The prohibition of the careless and improper admission of foul clothes on shipboard cannot be too strongly maintained. The common bedding, or even the wearing apparel of seamen, is frequently a nest or lodging of horrible foulness; and what is a consideration of an interesting nature, they may even contain the poison of disease; which, in a northern winter, may be productive of only moderate and scattered examples of disorder; but upon the return of summer, or departure into a warm climate, be the fruitful and unhappy source of diffusive mischief. The preclusion or exclusion of the possibility of introducing deriveable and impartible complaints, should be considered one of the most extensively beneficial of distributive prophylactics. Sometimes at the beginning of warfare, the men are suddenly huddled on board without the due and commendable deliberation and management. Upon these occasions, when necessity occasionally commands immediate performance; persons carrying about them the rudiments of disease, have been imprudently transferred from one ship to another; and thus mischievous effects have been injuriously and repeatedly propagated.

XXX. An occurrence of this kind may, if the vessel is crowded and consigned to a remote destination, completely frustrate the original intention. Sickness and consequent disability may become general; and, from deficiency of suitable medicinal assistance, be rendered calamitous and difficultly restrainable. The prevention of such evils is undoubtedly the circumstance which should always be judged most expedient and necessary: and if unluckily distemper should at any time enter, whether through ignorance or inattention; its suppression or extermination appears a resolution of immediate importance. The particular administration of the means, and the appropriation of the prophylactic management, must be regulated by the prevalence of the accompanying circumstances. Correctness of discipline and skilfulness of medical treatment, as specifically applicable, will then have the opportunity of manifesting their usefulness. As lately suggested, the person who has recently laboured under any severe illness (and this is of the greatest moment if the disorder has been of an infectious property) will commonly be cognoscible with tolerable easiness. Appearances will be remarkable to the eye of experience, which perhaps would not be perceptible to ordinary apprehension. These characteristic appearances may be multifarious, dispersedly observeable, or more particularly and confinedly displayed. One apparently insignificant symptom, either of foregoing or supervenient indisposition; will sometimes, to the intelligent observer, demonstrate more than an elaborate description; or the accidental assemblage of a numerous host of unimportant but anomalous symptoms. The opportune distinction and unfolding of a predisposition to a particular complaint may, by judiciously interposed assistance, enable the practitioner to obtain its interruption; or even after incomplete establishment, its more acceptable extermination. The accomplishment of an undertaking so highly desireable requires, however, the possession of a distinguishing promptitude; a convenience of circumstances which may not always be practicably or immediately obtainable. After all, it must again be said; and this undoubtedly is the commendable and most advantageous proposition; that preventing the embarcation of all infected persons, or those harbouring the miasmata of disorders; is the most suitable and effectual mode of management. This beneficial form of procedure being justly and fully observed in all its amplitude; no disease should afterwards become universally disseminated, or even incontrollably progressive, but through the most unpardonable blockishness, and the most inexcuseable mismanagement. If, however, a spreading disease should be introduced or ingenerated, the most adviseable means for its eradication must be thrown into employment. The diffusion or dispersion of an infectious complaint among a ship's company, under the guidance of the generality of marine practitioners, becomes sometimes difficultly manageable: this, however, is a misfortune which should generally or always be considered conquerable; and at no time should the medical officer allow himself to suppose; or at least positively to conclude, that the mischief may, or will become insuperable, and tend to overcome all his counteracting applications. The unavoidable consequences of this would be, the perplexity of embarrassment, the tardiness of irresolution, and the painfulness of disappointment: but some further observations upon this subject may perhaps be hereafter supplied; in the mean time, some general and conveniently understood suggestions are deemed sufficient.

XXXI. The complaints more commonly introduced through inattention or carelessness, are febrile ailments, assuming a difference of symptoms according to the prevalence of a multiplicity of circumstances. This dissimilitude of appearances, even in distempers of fundamentally and specifically the same description; or whose essence participates of no difference; may take its rise from an inexplicable particularity of constitution; the confinedness or exposedness of the patient; his cleanliness or dirtiness; the ventilation of his apartment; the treatment of his complaint, understood in all its particulars, and also its continuance: and in short, every thing which can affect his accommodation, will have unspeakable influence in the modification of the characteristic appearances. Febrile diseases, measles, smallpox, chincough, may severally be prevailing complaints; but the first are here supposed to be principally in contemplation. Those disorders, till lately, have commonly formed a conspicuous proportion in general returns. Improvement, however, and preventive management, have lately been more remarkably and universally advantageous.

XXXII. A comfortable and encouraging consideration it is, that most of those distempers which may be accidentally introduced, or casually engendered; are, at their commencement, for the most part, restrainable. The obstacles principally operating against their removement are such as these; unnecessary closeness; dirtiness; inconsistent and consequently prejudicial accumulation; promiscuous intercourse; indecisive, insufficient, or imperfect management. Cleanliness; ventilation; segregation of the complaining from the uninfected; a determinate and resolutely, but skilfully applied medical treatment; will ordinarily be found satisfactorily efficacious. Simplicity, and neatness, and promptitude, may even herein be gratefully conspicuous; and as being imitative of nature's plainness and unaffected kindness, are unquestionably commendable. The unavailing parade, bustling, and confusion of former days; the legitimate offspring of ignorance and wilfully maintained perversity, are now fortunately passing into disrepute and condemnation. All complicated and lumbersome management is perpetually objectionable; nay more, unnecessary, and will commonly prove proportionally incomplete and ineffectual. The scientific man will institute all his proceedings upon the simplest principles, and he will thus be at least equally sure of a successful termination to his undertaking. It is indubitably demonstrative of ignorance, or irresolution, to be entangled in the toils of multiplicity, embarrassed in the involutions of complication, or bewildered in the multitude of indeterminate applications.

XXXIII. The necessary examination of individuals, and purification, if judged requisite, being duly and justly accomplished, they may then be passed to their respective destinations. In the first formation of a ship's company, the regularity of discipline, the distinctness of management, the proportionate dispensation of chastisement, in which moderation, when becomingly and consistently allowable, is commendable, are all adviseable considerations. A particular discernment with commanders, officers, and surgeons, in the discharge of their duties, will now be particularly serviceable. And soberness, and steadiness, and honourable deportment, will first recommend a similitude of qualification in the commons; and, with commendable condescension, in combination with firmness, will, lastly, demonstrate disinterested friendship, and willingness and readiness to promote their convenience and happiness; and consequently, on their part, respectful attachment to their superiors; which to the illuminated understanding, will be a gratifying recompense.

XXXIV. If, as probably must occasionally happen, a number of them may never have been at sea, or at least accustomed to that mode of life, some allowances should be made, until they are familiarized with their new circumstances. All appearance of unnecessary severeness with those who may be discouraged and spiritless, from change of life, or who may appear despondent or sorrowful, should in general be avoided; moderation and cheerful exhortation will to these be serviceable. The mitigation or diminution of apparent surrounding difficulties, by a statement of their comparative insignificancy, &c. encouragement to the anticipation of kindness and supporting treatment, are all here justifiably recommended. These things are conducive to content and mental hilarity; progressive reconcilement, and accommodation to their circumstances; a lessening or blunting of the weariness of confinement; promptitude for enterprize; more graceful obedience; and, what is paramount to most considerations, will be contributory to the preservation of healthiness. An observation has long ago been made (and confirmed by prolonged experience) by marine practitioners, concerning seafaring people, that those who are dispirited, pusillanimous and disconsolate, are especially liable to indisposition. A distinction must here be made betwixt them and the lazy and inactive, and more particularly, those who may be labouring under the symptoms of incipient disease; and the sluggish and flagitious must be corrected by the remedies which are obviously applicable. The most grumbling and discontented may gradually be familiarized to a sailor's life; and, as in all situations of life, what perhaps at the outset seemed disagreeable or insurmountable, has, by resolution and perseverance, been unexpectedly vanquished, and reconciliation fortunately introduced.

XXXV. The slothful, and inactive, and fearful, will commonly be the fruitful subjects of disease; and their restoration will, for the most part, be more difficultly obtainable, than of those who are physically possessed of firmness and liveliness. These are notifications, the force of which the sagacious surgeon will continually carry in remembrance; and find their observance to be of remarkable importance in his professional department. He will, from penetrating and distinctive observation, be often capable of foretelling, whether such a person may be speedily cured, or his complaint may be indefinitely protracted; and these conclusions may sometimes be altogether attainable, from the proportion of the patient's despondence or confidence. These circum stances are mentioned, however, more in relation to the prevention of disease, than either its alleviation or removal. The last consideration not falling professedly within the compass of this compendium, will not, therefore, be particularly considered or illustrated.

XXXVI. The surgeon, from attentive observation, and consequent depulsive applications,can frequently be able to withstand, and almost immediately remove the symptoms of many complaints. He may thus counteract or suppress, at the very threshold, the approach of indisposition, and usefully preserve many serviceable, who, without this discriminating interference, might be the subjects of prolonged indisposition. A conscientious and diligently attentive practitioner, may in this manner be inconceivably serviceable to a ship's company, and without any ostentatious appearance; and while his professional endeavours may, to the uninformed or careless, seem inconsiderable. By a judiciously interposed prophylactic administration, effective stoutness, and consequently defensive capability, will be powerfully maintained. The opposite of this must occur in those ships, where there are not suitable discipline, and skilful and discerning professional management.

XXXVII. Although the letter of the law, contained in the voluminous judicialia, is, strictly speaking, similar in intention, agreeably to the offences, nevertheless it is occasionally administered with some incidental difference, according to the inclination of the commander. The inflictor of punishment may often be incapable of adjudging its proportion, and hence an important inequality betwixt the legislator and the executioner. An equability in this department; in penal execution, an unprejudiced application of chastisement, proportionately to the magnitude of the transgression; should most faithfully and perpetually predominate. It appears a most ungracious, and frequently an injudicious practice, to punish formally, and perhaps even severely, for every trifling offence. A general remark it has been, and the conclusion must be deemed true, that those are the most regular and useful men, amongst whom the instrument of castigation has been least employed. The imposition of punishment, for its considerate and allowable application; demands discernment, judgment, and a determination regulated by moderation. This matter has been only slightly touched in passing; and, as it more peculiarly appertains to the lex terræ, it would be improper in this place to undertake its examination.

XXXVIII. The preparative management is supposed, therefore, to have been thus far knowingly and properly conducted—the ship's company collected, organized, and apportioned to their respective and most suitable allotments; and now the whole contrivance may be considered so far complete. Experienced commanders, &c., it is understood, know how to proportion each man's employment, agreeably to his physical or artificial capability. And here it deserves to be remarked, that this is a part of the business requiring some attention, as the advantages therefrom resulting, will commonly be proportionate to the discrimination used in this management.

XXXIX. Different modes of dividing a ship's crew, for the purpose of watching, &c., prevail or are observed in ships; but commonly in those manned with a small number of people, they are separated into two parties; and thus their watchings become alternately successive. If they are prevented from loitering and sleeping in the daytime, in the intervals of their more particular engagements, the allowance of repose which they can thus receive, appears too contracted. One of the divisions can never enjoy more, and frequently less, than three hours and a half, for the purpose of sleeping. A reasonable supposition, or rather a veritable conclusion, drawn from the demonstration of universal observation, would declare, that the generality of mankind requires a longer period for the intention of repose, than the foresaid allowance. Continuing the most favourable and agreeable circumstances of navigation, the most prolonged allowance in most ships—in all, indeed, where there are only two watches—will not surpass five or six hours; which certainly, for most men, appears too constrained.

XL. The proposition can be exemplified; for thus the hammocks are generally whistled down about six o'clock in the evening, or differently, according to the season; but this illustration may be made applicable, when the days and nights have absolute or bordering equality. At this hour, is the beginning of a short watch; and therefore one division is kept in readiness or employment. If there is no particular business proceeding, some of those who are now supposed to be below or between decks, may turn in, as they call it; but this does not always happen; because sailors, as well as other folk, must have a little time for vespertine conversation and amusement. At eight, those below receive, in regular succession, their squeaking invocation; and then the party summoned must be in a state of attendance until midnight. They again obtain a respite till four in the morning, when they are regularly awakened to a renewal of attention. The division which has been employed, is thus relieved; but generally, a little after the hour for changing watches, as naturally happens in all these consecutive proceedings; and they may thus, sometimes, receive three hours of additional repose. If the hammocks, however, are early removed, as often happens in long and fine mornings, their respite may be restricted to two hours continuance.—This statement will show, that by an intermutual comparison, their proportion of rest is thus unavoidably circumscribed, and unpleasantly interrupted. By the methodical arrangement of the subdivision of the hours, especially by splitting the evening watch, a diurnal difference is thus conveniently introduced to each party respectively; so that a similar period is, every second day, regularly recurrent; but to the daily watches, a difference.

XLI. Mention has been made of some persons—generally men of severe and ardent study; also those influenced by the excitement of enterprize; or handicraftsmen, struggling for temporal subsistence—who have passed through a long life, with about a sixth part of their time only, expended in sleeping or repose. Those examples, however, are comparatively so infrequent, and the practice so inimical to the constitution, as in the general history of mankind, to constitute no precedent for imitation. Laziness and sleepiness, however, are unquestionably to be discommended; an unseasonable indulgence of these is condemnable; and almost perpetually, sooner or later, will be accompanied with a debasement of character, and a continually augmenting uselessness. In all ships in which there is a crew sufficiently numerous, they should be separated into three divisions; and thus they may commonly obtain a satisfying quantity of repose. Being thus suitably supported and strengthened, by a comfortable suspension of all their wearisome labours, they will be more pleasantly prepared for the effective discharge of their respective undertakings. The continuance of watching, generally four hours, will not, by this management and adjustment, be any thing lengthened. The men appertaining to each watch, (with the exclusion of uncommon occurrences,) will for the most part peacefully enjoy from six to eight hours of repose in every diurnal revolution. This method, therefore, whenever it can be consistently adopted, from its beneficial assistance to the poor seaman, should not be interdicted. And it may be worthy of attention, so to allocate their places or births for sleeping, that one division may interfere as little with another as possible.

XLII. A comparative estimation of respective firmness and apparent durability, preparative to the calculation of the probable continuance of constitutional healthiness, has been already declared to be commendable. Any person of moderate discernment and proportional application, and who, for some time, may have been accustomed to the observation of the behaviour and treatment of seamen, may form a tolerable conception of these circumstances, by an inspection of their respective appearances. And this is, confessedly, a subject upon which more careful attention should be bestowed, than is commonly observable, in an affair of such public moment. Something there is always in every man's character, or external expression, which to the discerning and intelligent, imports more satisfactory information, than can practicably be done in the most elaborate and extensive description. The more ordinary outlines of healthful or distempered constitutional appearances, heretofore transitorily and compendiously delivered, will, in some measure, aid the most appropriate and justifiable conclusions. And while this subject is under hasty examination, it may be suggested, as a proposition implying considerable usefulness, that every officer do acquire a tolerable knowledge (and which every intelligent and experienced officer really possesses) of the physical abilities, and mental disposition, of those who are under his occasional guidance and command. The aforementioned acquaintance; which will be particularly serviceable, and the acquirement of which will not be troublesome or expensive, to any man of a clear understanding and ready comprehension; will assist him very much in distributing to them their proportions of employment; and will, moreover, be a regulating measurement in the dispensation of discipline or chastisement. A reciprocal confidence should also be perpetually maintained. This practicable and agreeable confidence, will be an excellent inducement, to both parties, for the complacent and effectual performance of the duties of their respective departments. This state of affairs is a delicate and ticklish point to establish; but highly desireable and beneficial in the enjoyment; but this should be continually remembered, that it is easily subvertible by indiscretion.

XLIII. A necessary and regulating observation may here be made; that a sailor's indulgence should never exceed a determined proportion; otherways he may become an ungrateful, or, what would be more disagreeable, an offensive, stubborn, and refractory animal. Involved, commonly, in the most ungenial ignorance, and reared in the habitual imitation of iniquity and unrestrained wickedness, his morality, as well as his physical properties, will require consideration, and endeavours for amendment. Notwithstanding this unpleasant but true statement, the judicious and merciful commander will skilfully proportion their labours according to their particular capabilities. Their dispositions, as far as consistent with propriety, will lead to a determination for fixing their stations, where it may be most productive of contentment and usefulness. All these reflections, and many more which might be mentioned, are here considered as belonging to the general doctrine of preventing the occurrence of complaints. Indisposition is often accelerated, or distemper confirmed, by injudicious discipline; the unskilful application of employment; or inattention to the antecedent prognostics, or foreboding symptoms, of any particular complaint.

XLIV. A man may frequently be somewhat enfeebled, from some inconsiderable derangement of his ordinary share of healthiness, but not necessarily preventing him from attendance upon his customary occupation; nevertheless, propriety and prudence would dictate or prescribe, that his services for a time, should be abbreviated or moderated, according to his absolute capability. A sameness of management is sometimes applicable to those who are convalescents from preceding complaints. After a man hath regained a certain portion of health and strength, (in truth the useful, the willing man, will scarcely crave the indulgence,) idleness is always objectionable. The indolent and roguish frequently gain, in this state of health, upon the feelings of the pitiful surgeon; and by manifold disingenuous subterfuges, deceitfully (but generally awkwardly, in the keen eye of discernment) contrive an elongation of their exemption from employment. Complete restoration is often more accelerated by moderate exercise, than if they were allowed to remain in a state of inactivity; or where their own inclinations regulated their quantity of exercise or movements. Kindness, if indiscreetly or unseasonably conferred, may be considered superfluous and misapplied, if not prejudicial. A particular set of men will commonly be found on shipboard, who, after even a trifling illness, are particularly disinclined to reassume the performance of their customary occupation.

XLV. The distinction and satisfactory unmasking of men of this description—and the calculation of their actual ability—and the propriety of remanding them to their duty,—will sometimes require ingenuity, and the profitable assistance, so serviceably obtainable from enlightened observation. Their dispositions are almost constantly imbued with some share of craftiness and wickedness. The exploration of the discriminating and experienced practitioner, will soon determine and overcome all these groundless machinations; and the acute and steady officer, when he can place unsuspecting confidence in the surgeon's conclusions, will vigilantly and vigorously perform the duties in his department. Surrounding things all favourable, by management thus judiciously and determinately administered; the lingering, listless, irresolute, and slightly debilitated, instead of becoming absolutely unserviceable, may for a long time be supported; and when requisite, (in convalescents, for example,) by the interposition of suitable nutriment, the restoration to their constitutional share of healthiness will be the more expeditiously accomplished. In this manner, without any unkindness or appearance of harshness, the system which threatened to fall into declination, may be effectually maintained; and that which is in a state of amendment, will be more conveniently and effectually redintegrated.

XLVI. Sometimes a man, in a particular state of health, or condition of the weather, (or depending upon the climate,) may perhaps do a certain quantity of labour in the daytime; but should be excused from nocturnal watchings. Some of these proposals may, to the affectedly moderate, (but who often at heart are genuine and unmixed tyrants,) have the appearance of unkindness and rigorousness; but the willing and honest man will, always, while he retains a moderate proportion of ableness, rather be engaged in some gentle service, than be completely unoccupied. The distinction between him and a slothful, worthless person, is commonly not difficultly instituted; and, at all times and places, both adviseable and reasonable. The particular and immediate application of this distinctive and distributive discipline, must be governable by the predominancy of particular circumstances. The illustration of these matters, however, need not surely be tediously detailed, when it is reasonably understood, that the officers and surgeon come to their respective stations with a sufficiency of preparative knowledge.

XLVII. Premeditation, undoubtedly, is occasionally the groundwork of precaution; and with men of judgment, this conclusion is always applicable: but, unhappily for mankind, "nemo omnibus horis sapit," for some times the most prudently contrived measures may be thwartingly counteracted, or unexpectedly overwhelmed. A commander may have his ship's company apparently chosen with judgment and discernment; but after all his most laudable endeavours, his destination may be altogether different from what was his original expectation, or even particular information. He may have anticipated, from the likelihood of appearances, that it was determined for him to cruize in the British channel; but this supposition may, from a multitude of intervening occurrences, be to him unexpectedly and unhappily disappointed. His destination may be to the Mediterranean, or the West or East Indies; any one of these circumstances will necessarily introduce a very important difference in the concomitants and consequences of the undertaking.

XLVIII. As it is scarcely probable, that all the crew are entirely young, (or which, indeed, appears not altogether approveable or beneficial,) men advanced, therefore, in probability, to mid age, or even oldish men, if tolerably healthy, and remaining in their own climate, may sometimes usefully constitute a part; for if qualified by experience, and exemplary in their behaviour, they may be extremely serviceable in the institution and instruction of a ship's comparatively unprepared or unqualified company. But if they have enfeebled or vacillating constitutions, and the destination is to a foreign climate, men of this description, in such a voyage, are ready to become sacrifices to the uncommon hardships, and unfriendly occurrences, which in that circumstance must be so often unavoidable. A man at mid age, of a firm habit, regular in his conduct, circumspect in his management, may overcome all ordinary difficulties. The foresaid premature destruction, is, however, accelerated too commonly by irregularity, and the reiterated hurtful assumption of ardent spirits, or the mischievous inclination to drunkenness. These excesses, in company with the destroying influence of tropical climates, form the surest means of producing the forementioned acceleration of destruction. From the accumulation of evils so universally prevailing in these cases, their restoration becomes extremely doubtful, and too frequently impossible. The man who hath been accustomed to swallow injurious quantities of spiritous liquors, and therefore repeatedly liable to all the consequences of drunkenness; which are too well known to the marine surgeon to need specifical enumeration; after arriving at the age of forty or fifty-five, is peculiarly obnoxious to dissolution which is inevitable. The men, too, who have been harrassed with pulmonary complaints; or protracted, and more generally dispersed, rheumatic distempers; or who have suffered violent or prolonged intestinal disorders; are all occasionally, and sometimes suddenly, precipitated to the same conclusion. The proportionate consideration of such circumstances, and the probability of such occurrences, previously to commencing these voyages, would oftentimes preclude a preponderancy of inconvenience, and the irksomeness of disappointment. Men of the preceding character and description are only numerically significant; physically considered, they are only unpleasantly cumbersome.

XLIX. In tropical climates, constitutional exhaustion, with all its afflictive incapacities and concomitants, is almost invariably and unseasonably introduced. This conclusion is particularly applicable to men who have, deliberately and offensively, undermined their constitution by irregularity and intemperance. These improper practices, however detrimental in a temperate climate, are, in the tropical, demonstrably more condemnable and prejudicial. These observations, with the considerations they comprehend, will be taken into the computation; in the management of the diseased—and in the distinction of claimants for discharges—and in the prescription of invalidation.

In the West and East Indies, wretches may be seen, suffering from distemper, and fluctuating in weakness, yea, in jeopardy, every hour, very shortly after their arrival in the country. The most of these miserable examples of ignorance, folly, and vice, are unpropitiously addicted to an irreclaimable perseverance in their destructive imprudence and irregularity. They are sometimes boastful how they have outwitted the doctors; beguiled their constituents; relinquished the service in which they may have been occupied; and ultimately obtained their certificate of incapacity. "Tenuitque consuetudo, quæ quotidie magis invalescit." This, although a digressive observation, is abundantly and legitimately applicable; and an improvement of characteristic qualification would be particularly beneficial to the preservation of their constitutions, and materially abbreviate an unnecessary expenditure.

L. A foreknowledge, therefore, of a ship's destination, should always be deemed an important acquisition. For in these circumstances, those possessing the aforesaid particularity of constitution, are, for the most part, indisputably objectionable. Such men sometimes have defective appetites, imperfect digestion; and, if they have no other allowance of provisions but the ship's rough fare, they, in the continuance of a long voyage, or tedious cruize—and especially if the operations are conducted in the tropical and warmer climates—speedily undergo an additional and irretrievable deterioration. These observations will corroborate, and authenticate, the propriety and usefulness of the suggestions and instructions hereafter introduced, when speaking of dietetical ministration; and, moreover, they will then, in all probability, be better understood. The application of a wholesome nutritious diet, in conjunction with inviolable temperance, and regularity of digestive performance and intestinal evacuation, will now, when every other plan of treatment would prove unavailing or incomplete, be remarkably serviceable. A moderate allowance of expenses would be sufficient for procuring some necessaries for people in a state of accidental weakness, or those who become impaired by the continued use of the diet generally supplied.

LI. "They lavish gold out of the bag, and weigh silver in the balance," not for the formation of a god, or profane object of worship; but upon enterprizes, implicating views physically unattainable, or expeditions troublesome and unproductive; whereas, a contribution of a thousandth part of these unreasonable disbursements for the forementioned honourable and charitable design, would have caused the heart of the sorrowful to beat with joy—afforded comfort to the lingering and destitute—clothed the naked—and solaced the moribund. A rational and judicious attention to the circumstances giving cause for these animadversions, would ensure the profitable preservation of many; the public service would ultimately be rendered less expensive; stipends or pensions diminished; and deceitful and roguish vagabonds, who are now floating upon and plundering the community, be otherways kept in employment. Many of these worthless impostors, after they have accidentally acquired some degree of disability—subsequently by unsuitable management—apparently aggravate all their complaints; so that they artfully impose upon all who are not intimately acquainted with the nature, tendency, and extensiveness of their sophistical contrivances. The ultimate intention, or fulfilment rather, of all these deceptions and simulations, is the attainment of their release and discharge. Strictness, and determinate treatment, cannot be too diligently employed with men of this description. The assumption they set forth as a confirmation of their unfitness for general service, is impudently supported with all their untutored ingenuity, and stated with all the force of clumsy argument, and corroborated (in their opinion), by the interposition of the most blasphemous imprecations. In the calculation and resolution of the intelligent, and those thoroughly and intimately conversant with seamen, these fictitious evidences will never be convincing, or even preponderate.

LII. The commander who is solicitous about the efficiency of his ship's company; and without this his endeavours must frequently be doubtful, will naturally and maturely consider these reflections, when opportunity intervenes, and act accordingly. He will regulate his management, as far as possible, agreeably to the service in which he may be more especially occupied, the climate to which he may be determined, and the difficulty or comparative easiness of the undertaking. Some men, who have probably passed their meridian strength, may yet be serviceable on the confines of their native country, (that is, speaking somewhat differently, in their native climate,) longer than expectation could anticipate. If the people of this description should be incautiously carried into a foreign climate, their ruin would most probably be hastened, and destruction the unavoidable consequence. A commendation particularly applicable for the prolongation of the capability of these elderly, or somewhat debilitated men, is, that they most conscientiously maintain incorrupted regularity. Their acquaintance with the peculiarities and circumstances of a sea life, unless they are lamentably improvident and inconsistent, should teach them the most appropriate management of their exposure, diet and clothing. And it is here charitably supposed that the industrious and attentive seaman, hath accumulated a competent quantity and variety of garments adapted to his incidental necessities, so that when needed, he can change his clothes, and thus employ a precaution for obtaining some comfort, and diminishing the likelihood of the unfortunate occurrence of indisposition. A judiciously apportioned management of these men, a knowledge of which is deriveable from observation and experience, and the distributive superintendance of professional knowledge, would surely be indisputably commendable, and to the public service might be considerably and unexpectedly advantageous.

LIII. For the benefit also of the public service, those who are appointed for the examination or inspection of seamen intended for dismission, should be extremely inquisitive and circumspect in their proceedings. And here an accomplished professional knowledge, an extensive acquaintance with the particular department, and the deceitful and diabolical contrivances of seamen, will be wonderfully conducive to a satisfactory understanding of their circumstances. A regulation steadfast and unalterable it should be, never to discharge any who are capable of performing even a moderate share of employment.

This proposition, to some, may appear to have an injurious tendency; but the correctness of this condemnation, even upon an imperfect examination, will be at least very doubtful. In the Royal Navy, and other ships, there are always situations which do not generally require the exercise of the most vigorous strength. It is only in proceeding against the enemy where the effective firmness could be wished as complete and unyielding as possible. And as an encouragement and commendation of strictness, but distinctness in disciplinary administration with commanders, and careful performance of duty among surgeons, it is deservedly suggested and proposed, that sailors should not be so frequently dismissed on account of ulcers, and other complaints; occasionally, the latter, it is supposed, altogether simulated; as hath hitherto been customary. In discharging these fellows, they should pass under the most scrupulous investigation, and the regulating determination respecting them, should be susceptible of confirmation, (in the most satisfactory conclusions,) drawn from the most irrefragable demonstration of their undeniable incapability.

LIV. Consumptive complaints, and protracted and exasperated, or frequently recurrent rheumatism, will be found the most troublesome, and in common practice, the most obstinate, or more probably irremoveable. Diseases of the urinary organs, and of the head, after middle age, will also require their share of attention. The generality of ulcers are cureable, of however prolonged standing, unless they have been unskilfully treated, or wilfully neglected, or intentionally aggravated. These worthless fellows often conceal their sores as long as possible, and not uncommonly, as just said, wickedly contrive to discompose them, or perpetuate these noisome and frequently disqualifying mischiefs. The ascertainment of any villanous attempt to continue, exacerbate, or augment their sores, should punctually and rigorously be counteracted by the most decisively administered and exemplary punishment. In merchantmen too, there are many execrable vagabonds who designedly keep sores, upon their legs chiefly, in an open state, expressly for the purpose of preventing them being taken into the regular defensive service of their own country. This culpable and fraudulent behaviour, hath also been sometimes principally observed, upon their approaching a port, where they naturally, in warlike times, expect to be intercepted and detained for other purposes. Some time previously to their arrival at the suspicious harbours, if the surgeon is attentive to the conduct of all his patients, he may observe that some cunning fellows with sore legs, &c., will become more careless, and neglect, if possible, their regular attendance, for the requisite assistance; and moreover, it will be seen upon inspection, that their sores have degenerated very evidently from their former appearance. At this time, the sore which perhaps only two or three days before had assumed a healthy aspect, and which, the surgeon expected to be very shortly healed, will now be considerably augmented, degenerated, and offensive; and unless he is very peremptory with his patient, he will disregard, or rather attempt to continue the distemper.

LV. Ulcers, therefore, unless very unfavourably situated, extensive, regulated in their disposition by an unmanageable depravation of constitution, or obdurately inveterate, or with considerable demolition of muscular or tendinous structure; and particularly in oldish, declined, emaciated, and exhausted men; should almost continually be deemed, under skilful governance, remediable. And although it was not the original intention to have said anything on the history or treatment of this vexatious and disturbing disorder; yet the following suggestions and strictures may probably prove not irrelevant. The introductory consideration is, that with occasional exceptions, no ulcer, under the treatment of a skilful and an assiduous surgeon, should ever be allowed to become desperate, or altogether incureable. Spreading ulcers there undoubtedly are, and which speedily acquire an abhorrent foulness and unpromising appearance. These unfavourable signs of deterioration will frequently originate from some trifling alteration in the condition of the person's diet, the state of his bowels, or even from the qualities of the remedies topically applied. These unpromising phænomena are often made to assume the complexion of amendment, by the adoption of means which are seemingly inadequate. There are distinctness and accommodation of discriminative management, respectively and particularly applicable, which will, with the appearance of convenience and readiness, overcome circumstances which previously seemed insurmountable.

LVI. These apparently impracticable propositions may, to the ordinary run of marine surgeons, seem presumptuous and indefensible. Experience, however, which instructs even the foolish, must, in determinations of such remarkable importance, and more particularly when unprejudiced, be unobjectionable. At the beginning of these disorders, some cause for their appearing is commonly known, (but sometimes carefully concealed by a wicked seaman,) to have preceded, for a longer or shorter period, their occurrence. And a material point with the surgeon to ascertain is, whether they may have originated from causes operating more particularly or universally, or whether, these may not act in combination. Notwithstanding all that hath been written and published, &c. upon these unpleasant and frequently disabling complaints, the subject is still unaccountably embarrassed, and very imperfectly comprehended. The attention of students and young surgeons is scarcely ever sufficiently directed to the obtainment of a distinctive knowledge, and consequently scientific treatment, of these distempers. This imperfection appears to arise from two causes, which undoubtedly demand immediate rectification. The first reason therefore, is, their own unbefitting inattention or negligence, and the supposititious inconsiderableness of advantageousness in the acquirement of a knowledge of these matters, in all their truly diversified and perplexing circumstances. Another cause, is, the unpardonable carelessness, and insufficiency of professional instructors; who, in the course of a few desultory and imperfect prelections, only furnish some scattered and generally understood observations, upon surgical complaints and operations. Unfortunately, however, a multitude of circumstances and misfortunes, whose minuteness and hypothetical insignificancy with some, constituting exclusive arguments, are left unexplained. An inconceivable quantity of good might be done, (as in private practice, so especially necessary in the public service,) by a judicious and dexterous treatment of all the seemingly trifling blemishes, to which the surface may be casually obnoxious. This supposition, however, certainly implies a diligence, an industry, a cultivated persistence in observation, and proportionate management, which few, in strictness of language, can be said to have in possession. The successful consequences of this discrimination, and assiduousness of administration, will, notwithstanding the most unavoidably unfavourable circumstances, be to the upright an honourable and satisfactory compensation.

LVII. The skilful surgeon is aware, that in some constitutions, a slight scratch of the skin hath sometimes produced a painful and devastating mischief. He moreover knows, that the stinging of a musquitto, (as has happened in the practice of some,) hath induced such formidable consequences, as to render the removal of a limb necessary. All these accidents, at the moment of infliction, appeared to all concerned inconsiderable; but not so the unhappy consequences. Some of these occurrences may, at the outset, have seemed so truly unimportant, as not requiring any particular treatment.

LVIII. A thousand other considerations might be suggested; but they would to an experienced, honourable, and intelligent practitioner, appear in all likelihood derogatory. In relation to the subject more pointedly under immediate examination, it may be remarked, that the number of seamen dismissed from His Majesty's Navy, on account of ulcerous and other supposed incureable affections, is too extensive to be patiently tolerated. These worthless and abandoned men, afterwards with an intentionally supported, or unavoidable aggravation of all their infirmities, constitute so many of those disgraceful and abominable vagabonds, who are so commonly infesting and distressing a peaceful community. Idleness and laziness being peculiarly characteristic of their dispositions, they are wholly disinclined to any commendable occupation. Mendication, fraudulence, and surreptition, therefore, become their ordinary implements in obtaining a miserable subsistence. As lately said, with a few obstinate and intractable exceptions, no ulcers, no sores, should by the marine surgeon be condemned as irremediable. This latter conclusion is, in all cases, a most discouraging determination, and in many, is apparently unjustifiable. In qualification of the pointedness of these declarations, it is here understood, that there is not only a rational and intelligent medicinal ministration; but also that other circumstances are tolerably favourable. But as the four most extensive and principal considerations, both in the defence of health, and in the removal of many diseases, will be subsequently brought into particular examination, any additional observations upon the collateral assistances, here, seem unnecessary.

LIX. In destinations to foreign climates, as in some measure already explained, the assortment of the men is a consideration which, by the regardful, will never be overlooked. The youthful and healthful properties of them, generally speaking, will receive the first attention. These desireable properties, however, are not of themselves completely sufficient. There must be a consecutive, constitutional accommodation in those who are previously unaccustomed; which, when introduced, will be subsequently considerably beneficial in their preservation. This adventitious qualification is exemplified in many, who have gradually become familiarized to the impressions of tropical climates. This familiarity with unfavourable circumstances, as already explained; and which will hereafter be additionally illustrated, sometimes passes into a state of indifference, so that some individuals, would afterwards be as inclinable to continue in a tropical, as to live in their native country. This artificially obtainable indifference, or even what, with some, may be called preference, is generally explainable from several circumstances, more particularly applicable to the individuals. This adscititious systematic property, or perhaps it may be styled faculty, is however observable, and effective or operative, within determinate boundaries; and then the irresistible proclivity to declension and untimely senescence, become conspicuous. This again, will be modifiable, and respectively determinable, by a multitude of occurrences: such as his constitution, his regularity and temperance, his exposure, his cheerfulness or sorrowfulness, and other circumstances innumerable.

LX. This previously acquired fitness, and facility of enduring the influences of tropical climates, should be kept in view by those preparing for foreign destinations. This artificially imparted, and gradually established habitude, in conjunction with the requisite soundness of constitution, is undoubtedly highly commendable; and upon experimental ascertainment, will be found unspeakably advantageous. All the instructions already proposed for the completion of such desireable purposes, being duly regarded, every precaution will thus be employed, from which benefit is most probably deriveable. The management of their exposure, victualling, and habiliments, agreeably to the successive changes of their exposure to accompanying circumstances, will hereafter be brought under consideration. This one admonition cannot be too strongly impressed upon all who are concerned, or interested in the protection of health, that they must frequently and carefully be in a state of watchfulness.

LXI. The inexplicable dissimilarity of constitution, will, moreover, be susceptible of a diversity of disordered alteration and action; and will therefore, from the same general reasons, or a likeness and uniformity of causation, be productive of an inequality and disparity amongst the phænomena of complaints, as they occur in particular individuals. Constitutional susceptibility will also be remarkable, from circumstances, with the impressions of which, the persons in exposure may have been previously unacquainted. Febrile affection will sometimes be produced, or prejudicial slowness of the intestinal evacuation, headache, either immediately or more remotely as a consequence, and manifold other anomalous symptoms. Constitutions which, either primitively or accidentally, have high irritability, or improper vascular plenitude or tenseness, and in circulation an unnatural acceleration and quickness, will unexpectedly fall into indisposition. This is here understood to happen more especially upon passing into, or remaining in the more ungentle or annoying parts of tropical climates, or in any other region, where undue solar heat, and other unfriendly concomitants, may predominate. Many of these unpleasant feelings and mischiefs, are speedily removeable when they are seasonably and knowingly counteracted. This observation, however, is only extensively allowable, when the indisposition hath been skilfully and vigorously combated at the beginning. Sometimes, therefore, from unavoidable particularity of circumstances, or when the complaint hath been disregarded, misunderstood, or the treatment injudicious, the inconvenience may be aggravated or protracted. All these reflections are intended to come under the head of saving health, by instantly subverting the earliest sproutings of distemper, and thus, as far as physically practicable, prolonging both the healthiness and usefulness of a ship's company. For, let it be remembered, that many of these afflictions may be removed without confinement, or restricting the person from his service, and also, very frequently, without the imposition of any particular hardship. Or, supposing it may be adviseable to exempt him from actual employment for a short time, this is more commendable, and less detrimental, than a lengthening of inconvenience, from indiscretion, inefficient, or incongruous management.

LXII. A careful observation of nature's intentions and operations, and the application of suitable alimentary articles while the plan of treatment is proceeding, will be admirably efficacious. This is a conclusion, which is confessedly not continually, but very ordinarily, successful. In the East India Company's ships, or rather those engaged in their service, how many, and even previously stout fellows, are, for a length of time, disqualified for their occupations, seemingly for want of a few meals of suitable and nourishing victuals. A man, for example, is attacked with a smart illness, which may impair or destroy his appetite for two or three days, and often, chiefly for this reason, he is incapable of using the common allowance, the salt beef and coarse brown biscuit. His ailment, however, by the suitable interposition of remedial assistance, is perhaps, without any particular difficulty, and almost immediately, overcome. But in a warm clime, where weakness is commonly so important a concomitant, or supervenient circumstance, he may, in a very short time, be in a state of considerable exhaustion. In this condition of affairs, his recovery generally requires fourfold as much time as the removal of his complaint. The surgeon, in this unpleasant predicament, is sometimes, but most ungenerously and unreasonably, (and perhaps secretly,) blamed for a mischief which he deprecates; but which, as may now be conveniently understood, *suis viribus,* is not susceptible either of preclusion or abatement. This accursed evil is prevalent in these ships of burden, and must be avowedly and pertinently considered as a flagrant disgrace and iniquity. The inconvenience of these misfortunes, is peculiarly experienced in those ships, in which their original allowance of effective complement hath been inadequate.

LXIII. In proceeding into a warm climate, (if such is the destination,) the men should be carefully enjoined to moderation and regularity. The quantities of ardent spirits, as will be hereafter more distinctly explained, should certainly be rather diminished, and sparingly administered; or, as afterwards proposed, the substitution of beer, of middling strength, would be preferable. The allowance of salt beef, in some ships, appears to be too large; and might be lessened, especially in the warmer climates, with great propriety and advantage. An increase of the vegetable substances could then be suitably permitted. These might consist (but the assortment, &c., will in some degree be regulated by the season, and opportunity for obtaining the adviseable supplies), principally of potatoes, (or, in foreign countries,) yams, flour, peas, carrots, parsnips, &c. The individuals, who are threatened or incommoded with slowness of intestinal revolution, should be relieved; and at same time instructed concerning the propriety, or rather necessity, of maintaining a sufficiency and regularity of evacuation. Bloodletting, which hath frequently been imprudently, and sometimes inhumanely, recommended, will *very seldom* be requisite; and is scarcely ever adviseable exclusively for the sake of prevention. An improper or injurious load of systematic fulness, if such should ever be observeable, may soon be moderated, by a subduction of the quantities of solids and liquids employed for nourishment. The bowels should be copiously unloaded; for this, indeed, is oftentimes a consideration of the most immediate importance; and when sufficiently accomplished, will be productive of the most beneficial consequences.

LXIV. A multitude of irregular and nameless symptoms very commonly occur upon approaching the boundaries of tropical climates. Carefulness in observation will now be necessary, for detecting the very first appearances of diseased affection; and it is observeable, that the phænomena will often assume an astonishing difference of character; and if these circumstances are not thoroughly apprehended at the commencement, the opportunity and possibility of their immediate extermination will be unluckily disregarded, and not obtainable. Headache, occasionally accompanied with some other anomalous symptoms, will, seemingly and repeatedly, be the chief ground of complaint. An historical statement from some practical memoranda, formerly noted from immediate observation, may here be subjoined:—"Examples of headache occurred betwixt the northern tropical and equatorial lineations. In one man especially, vascular turgescence became seriously evident in the cerebral congeries, with bounding, forcible arterial pulsation, frequent in repetition, suffusio oculorum, &c. The discharge of a moderate quantity of blood; and the exhibition of a cathartic; and the avoidance of muscular exertion; remaining under coverture, &c.; speedily controlled the previously threatening symptoms. The headaches were generally combined with intestinal constipation; and which being removed, and no animal food employed for a day or two, they instantly subsided. These symptoms, apparently, principally happen in youthful fellows, of vigorous muscular and sanguineous contexture; and who, most probably, swallow a large quantity of animal provisions."

LXV. The observance of these symptoms immediately upon their first occurrence, is, when practically considered, of remarkable importance; as, by the application of suitable remedies, hazardous ills may be repelled, which otherways might terminate in dreadful consequences. But as formerly hinted, the writer refuses assent to the rash and indiscriminate employment of venæsection. And now, after lengthened practice in various regions of the earth, has never found it necessary, for the *purpose of prevention* exclusively, to renovate this operation. Cases of an instantly dangerous disposition, (through delay, neglect, &c.) are always exceptions to generally operative conclusions.—As will afterwards be particularly mentioned, when treating of cleanliness, it now becomes necessary that the men attend to this subject with sufficient carefulness and punctuality. This will constitute one of the best preventatives of unpleasant eruptions, and other superficial foulnesses and deformations. In tropical climates, if this is suitably and properly regarded, ablution, or general cleansing, should be daily performed. This practice, with a good diet, clean clothes, and unclogged intestines, will be very productive of comfort, strength, and the prevention of distemper. As already so strenuously recommended, the acquisition of the knowledge of respective constitutions, will enable surgeons to observe more correctly and usefully, the different mutations, as proceeding concomitantly or successively. A paleness, or wanness, or sallowness, with a defective or diminished expression of countenance, without any evident reason, often prognosticate the propinquity, or rather the commencement, of perhaps some previously unascertained complaint. The ambiguity of symptoms, too, in some of these sluggish and deceitful indispositions, to the unsuspecting or inexperienced, will prove sometimes considerably embarrassing. For symptoms of a particular distemper may present themselves, in a condition of the system, which is, in different persons, materially dissimilar. Appearances of excitement may be perceptible at one time, and perhaps very shortly thereafter, the most troublesome circumstances are, feebleness, debilitation, and constitutional impoverishment. The treatment, to be successful, must also assume, in propriety, a corresponding difference, either essentially or in its ministration.

LXVI. The surgeon also, when passing into a tropical climate, should be prepared for the treatment of a strange diversity of pimples, boils, furunculi, carbuncles, cutaneous efflorescences, excoriations, eczema solare, or prickly heat, as it is sometimes denominated, whitlows, &c. &c. And it may here be remarked, that in a crowded or unclean vessel especially, some of these affections will be often troublesome; and what at the beginning appeared of no importance, may pass into a desperate ulceration, or at least the uneasiness of a long confinement, and the uncertainty of the termination. If, however, skilfully managed, they are commonly removeable; and require cleanness, temperance, a correct condition of the alimentary channel, composure, sometimes beneficial and suitable applications. In some constitutions, the slightest abrasure of the surface, or trifling scratch or puncture, will almost instantly inflame, become painful, and thus perhaps a whole member will suddenly be brought into danger. Some of these consequences, in a warm climate, are precipitate in their appearance, and difficultly explicable in their dispositions. And some other uncommon occurrences will arrest the practitioner's attention, and require promptitude and discernment in their management. An abscess, for example, of some size, will occasionally form in particular states of constitution, in the course of twenty-four hours; and this without any cause assignable. A line of matter, nearly in the course of the tibialis anticus, has been known to form from the ancle to the garter, in a period of time nearly similar to the forementioned. The patient can often not give any reason capable for their production. Occasionally it may, however, be remarked, that upon pointed inquiry, the predisposition will be found to have originated from contusion or pressure; but the accident, from its mildness, or from the distance of time from its reception, hath generally been forgotten; and therefore, in the sufferer's estimation, the whole mischance lies in mysterious darkness. This inexplicable inclineableness to suddenness of appearance, in distempered phænomena, seems liable to take place, more especially, after the continued use of sea diet and exposure to augmented temperature.

LXVII. Several of the ailments already mentioned are produced, and certainly increased, by uncleanness, either of the corporeal surface, or of wearing apparel. And therefore this consideration will be afterwards introduced, as an argument strengthening and recommending the invariable maintenance of cleanliness. As sores have been casually mentioned, a few further remarks upon a subject so commonly happening to, and disabling the seafaring, and pestering the marine surgeon, will perchance be allowable. And as candour and integrity should constantly regulate the faithful practitioner's behaviour, the following reflections, committed to writing several years ago, in a foreign climate, may, by the industrious investigator, not be deemed either presumptuous or inapplicable. "In scratches, &c. of the inferior extremities, particular and careful attention has been bestowed upon dressing, and regularly and sufficiently supporting, the injured teguments; whereby the writer considers, that he has prevented the establishment of inveterate ulcers, in repeated examples. He cannot (——) refrain from adjecting his testimony to the commendation of the suitable application of the roller. The man who can survey matters in their diversified conditions; and who anxiously observes nature's labours in the different diseases incidental to animate structure; can, with tolerable certainty, forebode the most probable consequences. If a fellow with varices in his legs, suffers perhaps a slight scratch, it, in a few days, declines into an ulcer, obstinate and excavating. In those likeways who have laboured under protracted rheumatism, these effects will sometimes very readily ensue: and if such men be deposited in hospitals, prison-ships, &c., the consequences must be dreadful. Extensive suppurations, rapidly extending and destroying ulcerations, and then the horrible operation of mutilation is eventually deemed adviseable. The truth is, without the faithful and judicious application of the roller, many ulcers, and especially of the lower extremities, cannot be removed. Cotton or linen are the best materials for their formation, especially in warm climates. The proper method of applying the roller can only be obtained from practice.

LXVIII. "The roller appears preferable to adhesive plaster, for several reasons. 1st, The pressure thereby produced is more readily and conveniently obtained, and can operate more powerfully upon particular places. 2dly, It is more cleanly, or admits the preservation of cleanness. The natural transpiration is regularly absorbed and transmitted; whereas it is confined and retained by the plasters. 3dly, The pressure established by the roller is subservient and obedient, in a certain degree, (to the severally occurring conditions of a diseased member; *i. e.* upon any tumescence, &c. The materials of which rollers are generally composed, permit of elongation; and when subsidence or collapse happens, their natural elasticity then likeways operates; whereby they are constantly in contact with the surface, and eminently suitable to the diurnal and nocturnal state of such members,) to the alternate conditions of swelling or tendency to distension, and the lowering, which commonly happen, in the standing, or in the horizontal posture. 4th, Their application is more commodious, both to the surgeon and patient; and also their removal, &c." Additional observation and experience have produced a difference of opinion concerning these subjects. The judicious application of the adhesive plaster is now, very commonly, deemed the preferable mode of management. But it is worthy of remark, that occasionally a combination, or alternation, of these two modes of treatment, will be found most serviceable. The particular application of these auxiliaries, however, will be determinable by the judgment of the practitioner, and the nature of the accompanying circumstances. A reasonable, and therefore allowable conclusion, it appears to be, —that if an ulcer is unconnected with a materially distempered state of constitution; or not accompanied with uneasiness in a very considerable proportion; and if it is properly treated, confinement will seldom be necessary, or even beneficial. This conclusion is the legitimate offspring of attentive and careful observation, performed in most of the habitable latitudes, and drawn from the management of the most trifling scratches, to sores of four inches in diameter. A sore, it is candidly confessed, may so be placed as to produce irritation, or be the cause of imperfect command over a particular articulation; and some other exceptions will occasionally intervene; and the treatment of singular examples, therefore, must be left to the judgment of the practitioner in attendance.

LXIX. The foregoing procedure is principally recommended for the two subsequent considerations. The first, and not an immaterial one, is the advantages frequently obtainable from the moderate corporeal movements; and, if the forementioned precautions have been introduced, the propriety of the proposition will every day be conspicuous, from the progressive improvement. Another regulating argument, and which should never be neglected, is, that many fellows, when once they perceive that they are exempted from duty, on account of these defects, become indifferent; and, if possessed of indolent dispositions, would rather retard, if in their power, than do any thing for the promotion of their amendment. A difference of behaviour, however, will commonly be observeable, when they are convinced of the resolution and determination of the surgeon; and that they must thereby be positively and inevitably governable; and have no appearance of encouragement from their commander; they will obediently perform their task, and earnestly wish the removal of their maladies. This is a very important subject in the public services; and is more peculiarly applicable to the seafaring than the soldiery; but the comparative importance is, perhaps, not hitherto completely understood. These mischiefs are peculiarly liable to happen in that part of mankind—which may, in one point of view, be considered the most serviceable to the commonwealth—namely, labourers, soldiers, and sailors. The examination of these disorders, however, constitutes no immediate part of this dissertation; and therefore cannot consistently be investigated in all their particulars. A volume might be composed, explaining the production, differences, management, &c. of ulcers; but an extensive examination of these distempers, although a consideration of remarkable importance, would be irrelevant to these necessarily abbreviated observations. The surgeon should carry this fundamental regulation in faithful remembrance —that the largest share of ulcers, if under scientific guidance, and the patient performing his accustomed exercises, (or with judiciously determinable modifications,) will heal more conveniently, or at least more permanently, than if he had been excused from a common or moderate proportion of employment.

LXX. And, farther, on the subject of preserving health; generally, the suitable or seasonable time for dismissing a convalescent from the sick list, and returning him to his duty, sometimes requires considerable discernment in the application. General rules will not here be always prudently consistent; but the mode of procedure must be variable, in proportion to a multitude of incidental occurrences. Individuals, in complaints even of one denomination, will often need a difference of treatment towards the conclusion of their restoration; and sometimes disengagement from employment, until perfect recovery, may be commendable. And, when after the recuperation of a tolerable share of firmness, &c., some moderate exercise is generally considered adviseable, the proportioning of its application—so as to correspond with their respective constitutions, and be productive of no inconvenience, but, contrariwise, of advantage —will require discrimination. Some men, after they have regained a certain degree of strength, will improve more rapidly when moderately exercised; while others, who have apparently made as considerable advancement in convalescence, may find it prejudicial. Some of these differences may originate from the mildness or violence of the preceding diseases, from the primordial qualification of the constitution, the nature of the disorder, the climate, the patient's treatment, exposure, and his own regularity or its opposite; and, what seems of remarkable importance, the quality and quantity of alimentary subsistence. Another argument is thus fairly constituted, and established, of the propriety, or rather physical necessity, and usefulness, of having a knowledge of respective constitutions.

LXXI. As different men are naturally constituted with a capableness of tolerating, or bearing, an inequality of circumstances, with previously inconceivable indifference or convenience; so, also, others are disproportionally qualified for the endurance of a sameness or uninterrupted resemblance of circumstances. A particular description of men, after living on sea diet for a few weeks only, begin to decline, and become debilitated and emaciated; without specifying any particular complaint but weakness; the cause of which, by all, remains unsuspected, and consequently unexplained. This unpleasant and ungrateful circumstance, is ready to occur in some men who are labouring under premature senescence, from what cause soever this may have originated. The foundation of this untimely old age might probably be laid at a former period; and the more immediately productive circumstances complicated in their disposition and influence, and the remembrance of particulars, perhaps unsearchably obnubilated. The enumeration of all the causes which are possibly generative of this inconvenience, would here be inconsistent and superfluous. This exhortation, however, cannot be too strenuously recommended; how adviseable it continually is to remark the beginning of this change, and instantly attempting to oppose its progress, by supplying sufficient nutriment; and if any distempered modification is discoverable, the most efficacious remedies are forthwith to be administered. And it may also be observed, that sometimes these are men who have formerly laboured under intestinal complaints, which were troublesome or protracted, and which, in all probability, were never completely exterminated in all their mischievous ramifications and consequences. Rheumatic disposition, derangement of the mesenteric glandules, or of the tubes of nutrimental communication; the incipient and concealed state of scorbutic affection; should be taken into consideration. The same constitutional slenderness and debilitation, may have arisen from the injudicious or immoderate administration of deleterious or unsuitable medicaments; from the venereal disorder, or its improper treatment—a very common occurrence amongst seamen; from indigestion, sometimes aggravated by the improper use of the poisonous tobacco; from sorrowful impressions, especially when aggravated by prolongation, and other circumstances innumerable. The practicability of the ascertainment of the cause of this proneness to constitutional impairment, and ultimately destruction, sometimes would require the acute eye of experience; but when remarkable, should be straightway counteracted.

LXXII. After weakness and leanness—and which, it is observeable, are often accompanied with despondency, and which necessarily aggravates, indirectly, the original affection—have arrived at a certain degree of extent, without the interposition of suitable alimentary supplies, &c., the person may often be considered as in a state irremediable. The natural and inevitable tendency of many of these desperate cases of debilitation, is, from one stage to another, of progressive complication, and final destruction. Exemplifications of these misfortunes are, now and then, remarkable in voyages in foreign climates, or in tedious and vexatious cruises; in which discouragement, disappointment and hardships, have been particularly predominating and impressive. A listlessness and indifference, and perhaps an alteration of disposition, also a departure from the natural and accustomed expression of the countenance, are frequently, or rather almost constantly, conspicuous. The gait becomes languid, and tottering or insecure; and his determination and readiness for application and performance, are evidently and materially diminished; and there is often an unassignable fearfulness, bordering on silliness, and the gloomy prospects of despair. He complains, peradventure, of deficient appetite; or that he cannot use his ordinary provisions; that his bowels are irregular; that he is unable for his duty; but that he hath no other insurmountable disqualification, but his unpleasant companion, the weakness. These, and manifold other irregular phænomena, which it seems here unnecessary to particularize, will occasionally be embarrassing, and oftentimes difficultly computable. This systematic extenuation may proceed to a dangerous extent, without the cognoscible developement of scorbutic symptoms. This observation has been already suggested, and will afterwards be farther considered, and should be held in remembrance by the practitioner.

LXXIII. As previously insinuated, if such men are unluckily occupied in a harrassing cruise, or wearisome voyage, they are burdensome to themselves; and, if they have any feelings of repentance for recollected indiscretions, they become disconsolate and incapacitated proportionately; are truly troublesome to the practitioner, and ineffectual to their commanders. Repetitions, in matters of high concern, are allowable; and, therefore, it may again confidently be stated, that for the restoration of these persons, a generous and nutritious diet appears to be eminently necessary; and where exhaustion and other appearances demonstrate its usefulness, some wine, instead of ardent spirits, should be administered. And, moreover, it should constantly be a matter of observance with the medical attendant, that, in many of these cases, there is a probability of some hitherto undiscovered visceral disorder; and which may require the most inflexible penetration for unravelling the lurking, and frequently disguised mischief, and determinate management for its extermination. The exhaustions of elderly persons, and especially when happening in tropical climates, are ordinarily the most troublesome and intractable, or irremoveable. As long as they possess moderate strength, they should be occasionally, but discreetly, employed in some gentle exercise; for if complete idleness is permitted, their restoration will then be a still more improbable undertaking. This progressive leanness, or thinness, is sometimes antecedent to, or concomitant with, scorbutic disorder; but without some other expressive symptoms, should not be deemed indisputably and definitively conclusive.

LXXIV. After a ship's company has been exposed, for some time, to the customary or more ordinary impressions and operations of the occurrences of any climate, the endurance or tolerance of these will, for the most part, *cœteris paribus*, be gradually and materially facilitated; or otherways the resistance of those in exposure strengthened and familiarized. This declaration will not, certainly, be universally, or even in the same individual, unexceptionably applicable. The forementioned illustrations of indifference or deterioration of constitutions, will, most commonly, be much exasperated and hastened, in all their unfavourable circumstances. The determination concerning the tolerably healthy and regular, must and will be considerably dissimilar. For in those in possession of some pliableness and soundness of constitution, and, more particularly, when these fortunate properties are perpetually accompanied, and corroborated, with temperance and perspicacious management, the probability of the preservation of their healthiness, thus obtains additional confirmation. What at the commencement of the undertaking, or peregrination, (wheresoever the destination,) appeared intolerable or insuperable, is, by degrees, reduced into a consideration of indifference. In this manner, the persons who have previously been unacquainted with the confinement, and other troublesome circumstances, of a sea life, may be intricately or impliedly reconciled; and, after a moderate probationary exposition, these circumstances will, to them, be productive of no perceptible inconvenience.

LXXV. Notwithstanding these observations, which are made in relation to the progressive accommodation of constitution, the continuance of health will undoubtedly be modifiable, by the peculiarities of climate, or season, to which seamen are more particularly submissive. It has been long understood, and completely ascertained, that many of their complaints are attributable to the particularity of their circumstances; and, as formerly suggested, some of their illnesses, in the warmer climates, are frequently unexpected in their occurrence, vehement in their nature, and rapid in their progress. Some of these accidental complaints are peculiarly apt to display themselves in the youthful, the irritable and unseasoned, upon first entering tropical climates. These unforeseen, and sometimes troublesome derangements, appear amongst recruits proceeding to destinations in the warmer countries. Upon approaching a warm climate, as soon as the thermometer comes to seventy-five, or upwards, the officiating practitioner should be particularly attentive to every thing connected with the preservation of health, (or, which is virtually the same, the prevention of complaint). The prohibition of incautious and careless insolation, now becomes particularly adviseable. The unemployed, lubberly recruit, is now inclined to expose himself to the comfortable enjoyment of the sun's warming influence; but the consequences of this imprudent and injudicious exposure are sometimes unpleasant, if not seriously important.

LXXVI. A diversity of cutaneous eruptions, pimples, boils, &c., will also, in many, be the source of considerable annoyance. These arise from a variety of causes, which have, in some measure, been already, but will hereafter be more severely examined. The progressive augmentation of temperature induces different consequences in particular individuals. In some it is indirectly productive of slowness of intestinal evacuation; in others headache, accompanied with listlessness and irresolution. And as a dissuasive exhortation against languishing under the weight of conquerable, and comparatively insignificant occurrences, it may be truly said, the more these distempered feelings are cherished, they become the more burdensome, or apparently insupportable. In some of those who are rather plethoric and indolent, (and which are commonly attended with a slow state of the intestines, &c.) swellings of the feet and ancles (and, perhaps, with sprouting pimples), appear. There is a species of pimple which takes place, most generally, about the feet and ancles, but seldom observeable higher than the garter, and in persons of various habits. At their beginning, a small vesicle generally appears, encircled with some blushing redness; but this is commonly obscure, uncertain in its diffusion, and not always regular in its definition, or surrounding boundary. The vesicular elevation is, most ordinarily, of a bluish colour; the central point more or less pellucid; and the whole is painful. If this vesicle is disturbed, which, either accidentally or purposely, is often the case, inflammation instantly proceeds, and terminates in the formation of matter, accompanied, for the most part, with considerable uneasiness. The removal of the cuticle covering the vesicle, displays a small circular opening, with a little tag of cellular substance appearing.

LXXVII. One of these seemingly trifling pimples, a species of furunculus, will sometimes be productive of tumefaction and inflammation over a whole member; but, if properly managed, they seldom prove obstinate. When the affected cellular substance is withdrawn, and the edge of the sore assumes a healing aspect, there is rarely any farther difficulty. There is likeways another species, seemingly belonging to the carbuncle, in which there is a more extensive groundwork, and the integuments, over the most prominent part, are generally soon destroyed; and then the diseased surface appears somewhat similar to that produced by the operation of a candescent solid substance. These affections, for the most part, yield in the tolerably healthy, by opening the common channel properly, and applying a cooling lotion to the parts affected. The discharge of a little matter from the first species commonly affords relief, and the swelling, &c. speedily subside. As all other complaints to which the human body is liable, so also these superficial disorders, are very evidently determined, in their character and disposition, by the particular state of constitution.

LXXVIII. The prickly heat, as it is emphatically denominated, will also, upon arrival in tropical climates, appear in several; and is a sufficiently troublesome complaint. Some of the men, too, who are obliged to go aloft, and in the course of their occupation are pressing upon the yards, rigging, &c. with their knees, will sometimes have pimples, boils, or occasionally painful inflammatory swellings about the knee pan, or elsewhere, producing stiffness and other hampering uneasiness about the articulation. The discerning practitioner will institute a difference betwixt these phænomena, as presenting in a subject otherways unaffected, and in that which may be influenced by the scorbutic disposition. This is a consideration of the highest moment, and will never be forgotten by the intelligent practitioner, as in one state of circumstances, comparatively superficial applications may be adequate; whereas, if there is constitutional imperfection, more vigorous and general remedies will become indispensable.

LXXIX. Some of these disorders, and manifold others which need not be described, become remarkable at that critical period, when the lengthened employment of sea diet has superinduced a particular alteration in the preceding qualifications of the constitution, but which, in all probability, have not hitherto been discoverable, by any other particular or pathognomonic demonstration of specifically characterized distemper. This critical alteration presents itself (or perhaps, speaking more correctly, commences) at different distances of time from the application of the causes of its existence and formation. The interval from the incipient operation of the causes, till the evident unfolding of the consequences, will, from a multitude of circumstances, be extremely variable; and which, on account of the foregoing observations, and from what will be afterwards delivered, need not be fully repeated nor anticipated. A space of time, varying from six to ten or twelve weeks, (but in numerous examples after a much longer interval,) some of these phænomena of artificially introduced indisposition will be remarkable.

LXXX. The magnitude of these consequences will be wonderfully regulated, by an unaccountable conglomeration of circumstances; whether antecedent or subsequent to embarcation, or the commencement of an expedition, or the use of such diet and exposure to such other causes, as, collaterally, may promote these unhealthy alterations. Also, some inscrutable particularity of constitution, the nature and condition of the alimentary supplies, which are commonly allowable on shipboard; the qualities of the weather, the closeness or freeness of the ship, her cleanness or dirtiness, as well as that of the individual, also the state of his mind, his despondency or exhilaration, his discontentment or satisfaction, may contribute to the prolongation of healthiness; or oppositely, to the acceleration of indisposition, and often remarkably of scorbutic complaint. These observations are designedly introduced, for supporting and explaining the propriety, and preconceived usefulness, of the general doctrine contained in the preceding animadversions, and compendized elucidations, in which it has been strenuously and unfeignedly inculcated, carefully to observe the common condition of the men's health, —this is a duty belonging to surgeons, commanders, and all officially interested in, and responsible for, the conservation of healthiness. By this seasonable observation, the very first symptoms of deviation from the natural standard of health will be happily ascertained, and the suitable remedies and treatment instantly administered. And be it further known to all concerned, that with the intention of preserving health and strength as long as possible, it will be requisite for seamen to receive an allowance of unsalted provisions, at the expiration of every eighth, tenth, or at farthest every twelfth hebdomadal revolution. If the use of sea diet be continued much beyond these terms, unless the men have been unusually healthy at the commencement; indisposition, and diminution of physical capability, must thereby be inevitably introduced.

LXXXI. Many of the symptoms customarily enumerated, as declarative of the beginning or existence of scorbutic complaints, are very deceitful; and if unsuspecting confidence be placed in them, as undoubtedly characteristic of this distemper, they will sometimes unhappily disappoint the uninformed or inexperienced. The impropriety and inconsistency of many of the observations, communicated by annotators and scribblers, upon the diseases of seamen, are too well understood by the enlightened practitioner, to be here intendedly investigated, for their disapproval and reprobation. The disposition or proclivity to this disorder, may, in some constitutions, exist in a serious or even dangerous degree, without any very particular, discernible, or even remarkable manifestation, and the determination must often be drawn, therefore, from a concourse of general, rather than ordinarily reputed topically characteristic circumstances. The surgeon who is in possession of sufficient knowledge, and proportionate opportunities for observation, will rarely be embarrassed in his regulating conclusions. It is deserving to be mentioned, that many of the symptoms commonly enumerated, are likeways considered as incontestibly showing the existence of this complaint, and without the declaration of these phænomena, the progress of the disease must be inconsiderable. As an affirmation, in opposition to such an unqualified enunciation, however, it has just been said, and here again pointedly repeated, that this disease may be unperceivably devastating or undermining the constitution. And, what is a reflection of the highest importance, may have made considerable advancement, without displaying those phænomena, which have been so peremptorily said to be particularly and conclusively characteristic.

LXXXII. The marine surgeon, who, it may be supposed, is performing his first cruise or voyage, may not be in a state of immediate preparation for the satisfactory ascertainment of so unexpected an occurrence. He will be dubiously waiting for the evolution of the symptoms, which he has been confidently taught, to be continually and expressly indicative of the existence of this distemper. Continuing this hesitation and deliberation, his patient may be tottering in danger, or declining rapidly to that bourne from which no traveller ever returns. In some examples, indeed, there are an unnatural but expressive appearance of the countenance, a remarkable discoloration of the complexion, an indescribable feebleness, faintishness, and cloudiness, a mournful sadness, and a universal appearance of weariness or lassitude; but for these, and numberless other circumstances, some of which shall hereafter be more fully enumerated, the person is unconscious of any cause, which he can think sufficient for their production. The constitutional derangement, although not distinguishable by common observation, will often, to the eye of experience, be peculiarly expressive and significant. And moreover, there will sometimes be discoloration, tumefaction, stiffness, instability, weakness, tenderness, &c. of the inferior extremities.

LXXXIII. The discernment and confidence, which are collaterally supported, and sanctioned by faithful and profitable observation and experience, and judicious comparison, as just hinted, will seldom be implicated in perplexity, with all its disagreeable consequences. The gums may appear to have a moderate proportion of soundness and floridness, even when the disorder has made considerable systematic progression. It is even not impossible, and far from improbable, for death sometimes to happen suddenly, without the prominently manifested occurrence of those premonitory symptoms, which ignorance, or an implicit, but blameable confidence in the suggestions and descriptions of some, would lead the practitioner to anticipate. This is a consideration of such indispensable importance, as never to be disregarded, far less overlooked: and the youthful surgeon will do well to regulate his management accordingly. He must not trust to the collected histories and traditional information of lecturers, nor to the uncertain, and frequently misguiding descriptions of travellers, compilers, nor even to those who have written professedly and intentionally on this complaint. No! he must institute and maintain habits of industrious, scrutinizing, and distinctive observation; he must watch nature with anxious assiduity, in all her evolutions, in all her vicissitudes, in all her movements. The successful treatment of symptoms, which were obscurely discernible by the penetration of the less ingenious, and instructed; will be a consolation, and acceptable gratification and recompence to him, in the hour of undisturbed consideration.

LXXXIV. The particular examination of this distemper would here be unbecoming, and not requisite in this elementary compendium. The foregoing curtailed remarks have been introduced, purposely to excite a due attention to a subject of such importance amongst seamen; and which, at former periods, committed such mischief upon, commonly, a very worthless, but serviceable part of the humankind. The occurrence of this complaint is now become less frequent, and from suitable precautions its consequences are now not so calamitous. These pleasing circumstances are the results, not of any one mode singularly efficacious, but of general management. The improvement of ships, of their method of victualling, the increased attention to the proper supply of fresh air, cleanliness, &c., all contribute to the production and preservation of these desireable consequences—a proportional augmentation of the maintenance of healthiness, and consequently, of constitutional effectiveness.

LXXXV. Different attempts and methods have been employed to prevent this disease, both by the mode of victualling, and by the occasional interposition of some substances, not to be considered so properly dietetical as remedial. In the Navy and elsewhere, it has frequently been the practice to administer lime juice, either more constantly, or with diminished repetition. There is sufficient reason to conclude, that this has been often done, without the commendable and appropriate discrimination, and not unfrequently without advantage; for if injudiciously administered, it will be sometimes prejudicial. The indeterminate or unintermitted application of this article, as a preservative, appears unnecessary, incongruous, and indeed absolutely objectionable. An observation has been made, by those who have been long accustomed to the treatment of seamen's complaints, that the protracted exhibition of lime juice has been productive of lankness, weakness, and impaired appetite; and thus, in some measure, inducing effects which, at best, may always be considered as unfavourable, and which, after all this comparatively unprofitable administration, must be opposed and conquered with diet of a nutritive property. The lime juice must therefore be given with defineable intentions, and should, with occasional exceptions, which the judgment of those interested with the management must determine, be prescribed as a medicinal substance; and if it is genuine, &c. a moderate quantity will answer the purpose. This article has often been given in apparently uncommon quantities; but in these instances, it must probably have been deteriorated, either by naturally happening chemical alterations, or, as frequently occurs, have undergone artificial and iniquitous debasement.

LXXXVI. A sufficiency of chemical knowledge will ordinarily determine, if it has suffered any injurious adulteration. The different acids with which it can be rendered more poignant, (but so much the less effectual,) are all pretty easily discoverable; but the acid juices of different acrimonious vegetables, &c.

may be blended, and their nature and amount cannot afterwards be ascertained completely, by any chemical operation. The sulphuric acid will be the one most commonly employed for imparting additional sourness to lime juice, which may have become impaired either by keeping or dilution. It seems less probable that the muriatic acid should be used for this purpose, or that the nitric acid should be conjoined with the vegetable acid, intentionally for adulteration. The presence of the two first of these acids is not difficultly determinable, even although they shall have been added in a very diminutive proportion. The muriate of barytes is the most delicate test for the discovery of sulphuric acid. It will produce an observeable precipitate, when this acid is mingled in the smallest quantity imaginable. Even the acetate of lead will be sufficient to cause a precipitate, when the juice contains a ninety thousandth part of sulphuric acid; but the first of these tests deserves the most confidence—it is the most delicate and accurately applicable. If the smallest quantity of muriatic acid has been added, it may be detected by the nitrate of silver; either by touching the surface of the liquid with the solid substance, or by adding a little of its aqueous solution. Its application will instantly cause milky streaks, or cloudiness, in proportion to the adulteration. The nitric acid is scarcely to be discovered by any means, excepting by the salts which it may form with the alkaline, &c. substances, which may have been used for its discovery. If vinegar has been conjoined, its presence may be ascertained by evaporating some of the liquid in a porcelain or glass vessel, and then adding some sulphuric acid, when the odour of vinegar, if there has been any blended, will become perceptible. It may likeways be discovered from its salts, with alkaline substances. The addition of these extraneous and injurious substances, is sometimes to be suspected by merely tasting the liquid, from the peculiarly unpleasant and unnatural impression; along with the taste of the lime juice, there is imparted the sensation of unusual acrimony, or tartness.

LXXXVII. No preparation of this fluid, under what denomination soever it is proposed to the public, is comparable to the native juice, clarified and unmingled. The citric acid, in the crystallized state, has been proposed and employed, in scorbutic affection; but it is not absolutely determined that this preparation is equivalent to the juice expressed, and nearly in its natural condition. The convenience of stowing it would seem to be its most remarkable commendation. If it could always be obtained free of adulteration, it deserves at least a fair trial. The quantity of it required to acidulate water, so as to resemble, in some measure, the native lime juice, is considerable, being almost one part to sixteen, or one ounce to a pint of water. The dose of the citric acid may vary from ten to forty grains. When dissolved, in the proportion of ten to twenty grains in a pint of water, with the addition of a little sugar, it constitutes an agreeable cooling beverage. If the liquor is slightly imbued with lemon peel, it will be still more acceptable. About a scruple of the citric acid to a pint of water, prepared in this manner, will resemble the beverage commonly called lemonade, which is so grateful and refreshing in the warmer climates. A powerful objection against confiding in the citric acid, for the prevention or subduction of scurvy, is, its liability to adulteration. It appears extremely probable, that it is very commonly influenced in its properties by improper additions.

LXXXVIII. It may be corrupted or deteriorated by different unsuitable admixtures. It may be combined with the tartaric acid; with citrate of lime; and likeways with the super-oxalate of potash. These would appear to be the most common substances with which the citric acid is conjoined. The super-oxalate of potash, which is the native salt of sorrel, the oxalis acetosella; is frequently used under the name of the Essential Salt of Lemons. And what is of particular importance, the oxalic acid is in a certain degree poisonous: it has produced death when swallowed in the quantity of four drachms. As this substance is occasionally substituted for the genuine citric acid; such dangerous procedure may be the cause of mischievous consequences. Until all these evils be obviated, the native lime juice, as particularly recommended, deserves the preference. It appears unnecessary to enumerate the modes of detecting these adulterations, for those who can be so diabolical as to commit such unreasonable debasement, should at least be condemned to lose an article which they have so villanously disqualified. If any preparation, therefore, under the denomination of citric acid, should ever be employed for the prevention or mitigation, &c. of scorbutic disposition, it should previously be ascertained to be completely void of all improper combination. As it is a remedy upon which considerable trust must sometimes be reposed, a satisfactory confidence of its genuine qualities should always be regarded as indispensable. The suitable attention to the obtaining and preserving of the lime juice, therefore, becomes an object never to be disregarded. The juice, when properly managed, as herein suggested and explained, will retain its powers so as to be useful during even prolonged voyages.

LXXXIX. The proper keeping of this remedy, for such it may be esteemed, demands attention; for through neglect, it is often materially impaired in its properties, and then no confidence can or should be placed in its exhibition, and no probable calculation of its expected operation and influence is obtainable. Sometimes the juice is simply expressed from the fruit, and afterwards not allowed to deposite its impurities, or be otherways disengaged from all the membranous substances, and other parts of the natural texture of the lime, which evidently disqualify the juice for the desireable preservation. The filamentous, membranous, and mucilaginous component parts, which now are to be considered as foreign, should all be thoroughly separated, for if allowed to continue with the expressed juice, they cause it to undergo fermentation; and this happens more particularly in warm weather, or in the warmer climates—and part of the fermenting operation terminates in a modification of putrefaction. The properties of this fluid, which are so essentially necessary to successful exhibition, are thus subjected to an alteration, by which it is rendered almost useless.

XC. When the juice is intended for keeping, it should be carefully separated from the fruit, and afterwards permitted to continue in a cool place undisturbed. By this treatment, the grosser and heavier matters will gradually sink, and settle, and the supernatant liquor becomes transparent. This fluid should now be cautiously drawn off, either by a stopcock properly situated, or by the assistance of a siphon, and then strained through several folds of gauze, bunting, or flannel. A small proportion of ardent spirit, (an eighth part may suffice,) and for this purpose the best British proof spirit may be preferable, should then be added to the strained liquor, and the mixture allowed to remain for a little, and finally submitted to an additional percolation in glass funnels, whose throats are filled with pebbles, silicious sand, or other suitable materials, upon which the acid may have no chemical influence. The lime juice having carefully passed through this mode of preparation, should be put into glass bottles, which are perfectly clean, and made air-tight by suitable closure. The juice being carefully procured from good fruit, in a proper state of ripeness, judiciously depurated, may be considered as a medicinal substance, which, when adviseable or necessary, may be administered with proportional confidence.

XCI. The diurnal allowance of good lime juice, will, for preventing disposition to scorbutic disorders, or even for combating their presence, proceed from half an ounce to two ounces, divisionally administered. If speedy benefit be expected from its exhibition, the proportion of salted victuals should certainly be diminished, or if practicable, altogether withdrawn, and vegetable substances of a commendable description be given in substitution. The goodness of the water employed upon these occasions, although a subject little regarded, and perhaps less understood, will prove, collaterally, peculiarly beneficial. The lime juice, as aforesaid, possessing sufficient goodness, and other circumstances not insurmountably unfavourable; and judiciously administered, an improvement or amendment in constitutional appearances should, in four, five, or six days, be indisputably remarkable. Continuing its employment, if there is considerable weakness or systematic extenuation observeable, a little port wine, or Madeira perhaps, should be preferred; and some fresh meat also, will contribute admirably to the restoration. The space of ten or twelve days should, generally speaking, introduce the alterations desireable; and will, other circumstances not particularly unpropitious, be satisfactorily accomplished. After the reinstatement of tolerable health, it appears, for the most part, that its continuance should be interrupted, or, at the farthest, small occasional quantities, for a short time afterwards, administered.

XCII. The vegetable acid should be largely diluted, and some sugar added before its exhibition; and sometimes, as lately mentioned, the combination of a little wine will be necessary, and remarkably beneficial. This suitable dilution and admixture will render it both more palateable, (and therefore more acceptable,) and less offensive to the stomach. This last consideration, in this complaint, which is so commonly accompanied with feebleness, and defective appetite, and impaired digestion, is always of importance. All ships in foreign stations, where they can procure the fruit, should prepare the juice themselves, and thus be acquainted with its natural history, and consequently with its genuineness. In the East India marine service it is generally sent on board in casks, often also of very inferior quality, or adulterine; and, too often, no farther attention bestowed upon its preservation. This is not much better than the humanity and kindness they show, in their allowances, to those labouring under complaints. They may withdraw from temporal existence, without the suitable alimentary assistances, unless a commander, more commiserating than expectation, supplies them with some scraps from his own table! So, the commendation of a service incontestibly disapproved, and apparently approaching a dissolution which will be unlamented.

XCIII. The skilful and discerning application of these more common and ordinary means of maintaining health, and combating the beginning symptoms of disease, will ensure the usefulness of a ship's company much longer than might otherways be attainable. By the discriminating adjustment of their application, a thing of the greatest consequence in ships with insufficient companies, few will, comparatively, be disqualified by distempered incapability. The shortness of the sick-list should always be a matter of gratification, both to the rational surgeon, and the intelligent and considerate commander. Ships often perform long cruises, or voyages, without the possibility of receiving the suitable supplies of fresh provisions, which are so necessary for maintaining health and strength unimpaired. Voyages to the East Indies are sometimes accomplished, without stopping or halting, at any intervening point, for the purpose of obtaining recruiting supplies. This proceeding, almost invariably, and especially in merchantmen, occupies too much time to be unattended with inconvenience and prejudicial consequences. The half-worn people, who so generally, during warfare, constitute a larger or smaller part of these ships' crews, suffer materially before the completion of the outward passage, or some of them are absolutely destroyed. After the expiration of ten, twelve, or fourteen weeks, (variously modified in different instances,) they become languid, listless, and discouraged; and emaciation, and exhaustion, and probably scorbutic disease, are mischiefs which now require to be combated. And here there occurs a sorrowful and disheartening consideration,—that unless a proper quantity of nourishing food can be procured, the business of recovery is truly a hopeless and distressing undertaking. "At perficere tantum opus," (*sine victu idoneo,*) "arduum est, et nemo perfecit." The description of the manifold attending mischiefs and misfortunes would, to the intelligent and experienced practitioner, be superfluous, or seem presumptuous.

XCIV. Information is communicated by those who have been most conversant with the affairs, but especially the diseases of seamen, that this class of people generally acquire a premature or untimely senescence. This appears a conclusion undeniable; and which the observation of every one, who has had opportunity of seeing these people, in all their changeable circumstances, will evidently and strongly confirm. This artificially accelerated degeneration of constitution happens, in these unlucky and indiscreet persons, in all climates; but in the tropical, this unfortunate and unseasonable proneness to dissolution is more peremptorily and unavoidably superinduced. The premature spoliation and destruction, so commonly effectuated by the impairing influence of these climates, and the so peculiarly stamped evidence of their unfriendly operations, in most people who have thus been exposed, are so characteristic, so strikingly descriptive, that the man who is familiarized to acuteness of observation, will frequently distinguish the individual, who hath, for some time, sojourned in the warmer and more unhealthy latitudes. In this manner, the person who has lately returned from a warm climate, even although he considers himself in possession of health seemingly unaffected, nevertheless presents something so particular to the observance of the critical examiner, that the latter frequently can point him out, amongst healthy standards, with unexpected exactness.

XCV. This irresistibly accelerated disposition to senescence, is productive of unpleasant consequences, and mournful devastation, amongst that miserable part of mankind, which is employed in marine, warlike, or commercial engagement. This inevitable and perpetual diminution of constitutional susceptibility, and other frequently intervening misfortunes and hardships of a sea life, augment, in belligerent times, especially, the demand for recruits of these people in a proportion sufficiently declarative of the truth of the general proposition. As an indemnifying consideration, against any uncharitable animadversions, however, it may be remarked, that the mechanically accelerated progression of a sailor's life is oft not so much owing to the immediate attendants of his occupation, as to his own imprudence and irregularity. These are confessedly lamentable considerations, and such as every genuine patriot must sincerely bewail and deprecate; for the avoidance of any unnecessary waste of human life is certainly a subject of the most interesting importance. The prevention, or even mitigation, of these distresses and calamities, are, however, unhappily for them, not conveniently or uniformly obtainable. That naturally implanted perverseness, stubbornness and inconsideration; that habitually and practically maintained propensity to all conceivable wickedness; and abominable and irreclaimed inclination to drunkenness; are some of their unhappy and unfortunate circumstances. And although the doctrine of morality and castigation of wickedness do not necessarily constitute any part of this undertaking, the subsequent statement is allowable, as founded upon a basis, stable as the immutability of demonstration. And which is, an amendment of their dispositions must anticipate, and accompany, the attainment and confirmation of their improvement. This proposition is applicable, whether these improper qualities are intrinsical and corroborated by a transmitted and prevailing rudeness, and corruption of dispositions, and continually aggravated by the possessor's practical maintenance; or whether they, in some measure, be accidentally introduced, and unhappily authorized, by the unceasing contagion of worthless example, and unrestrained licentiousness. A primordial roughness, harshness, and inflexibility of temperament—and additionally encouraged and strengthened by flagitious influences, and the most expeditely and imitatively confirming inclination—predispose and constitute these wretched people for the perpetration of wickedness. The groundwork and commencement of their improvement must, therefore, consist principally in intellectual illumination. The doctrine or discipline of instructive melioration must be energetically communicated, or the expectation of amendment will be disappointed. Their views must be gradually and pleasantly interested in its propriety and advantage; and the undertaking must not apparently implicate much labour or study, otherways, their fastidious disapproval, and the anticipation of lengthened and associated attention, will, with them, become considerations subversive of perseverance.

XCVI. The offensive and execrable vice of drunkenness, with all its concomitant enormities and consequent mischiefs, have been, and are, too constantly observeable, to need extensive discussion. Excluding even the wickedness and immediately disqualifying circumstances, the contraction of a loathsome distemper, with its subsequent concealment, or injudicious management, have been peculiarly mischievous and destructive. Seafaring people are obnoxious, too, from the nature of their life, to different painful and exhausting complaints. Rheumatism, catarrh, pneumonia, febrile diseases, partaking of uncertain but extensive variegation, scorbutic complaint, which to them is a more undermining and injurious disorder than has generally been imagined or believed. All these, and especially in their frequently unavoidable aggravations, are indubitably and frequently conducive to the forementioned liableness to unseasonable extermination. In the estimation of all acquainted with the history of seamen, the foregoing observations must be deemed conclusive; the reality of this progressive abridgment of the span of human life, must, from these and equivalent considerations, now have confirmation irresistible.

XCVII. In all situations, whether in the frigorific, the temperate, or severely heated climes, the regularity and sufficient frequency of intestinal evacuation, is a consideration of the most indispensable consequence. A suitable admonition it is, therefore, to those men, who either from constitutional qualification, or from accidentally accompanying circumstances, (such as the nature and quality of their victuals, the peculiar condition of the climate, &c. &c.) are liable to slowness of the intestines, to be extremely attentive to the naturally premonitory impulses, and promote the intention by persevering endeavour and solicitation. The establishment of the requisite regularity may occasionally be accomplished without the interposition of artificial assistance; and this, in those who are otherways healthy, is commonly preferable. The punctual observance of nature's periodical visitations, cannot be too strongly recommended; and, if occasionally necessary, the purpose should be aided by the exhibition of suitable medicines, until the desireable revolutions are in their proper course established. This subject is too often neglected or disregarded by the thoughtless or inattentive; and, being a circumstance, in the estimation of the ludicrous, affected, or delicate, rather partaking of ridiculous or impure conception, the whole matter is witlessly turned into burlesque, and thus many foolishly suffer for their indiscretion. Numerous residents in tropical climates are seriously disturbed, and ultimately injured, by neglecting the regularity and sufficiency of intestinal evacuation. Slowness of the bowels, especially in the warmer climates, is the productive cause of manifold and diversified distempers.

XCVIII. This tardiness of the requisite sufficiency of intestinal evacuation, and especially when habitual, is productive of a multitude of anomalous symptoms. Some of these annoying feelings are so uncertain and indefinite, as not to be conveniently referable to any particular family of diseases, and, with the inexperienced, are consequently unaccountable, in all their circumstances. Among these irksome phænomena may be enumerated, headache of different intensities, and variable also in its perceptible spot of occupancy; sickness at stomach, impaired appetite; disorder of the hepatic functions, and sometimes of its organical structure; thrillings, creepings (formicationes), and other uncommon sensations diffused on the surface; heaviness, listlessness, uneasiness; stiffness, and the perception of immobility of the loins; gravitation, disagreeable sluggishness, and unpleasing intumescence in the abdomen; foul tongue, vitiated taste; dull and itchy eyes; drowsiness, and nocturnal inquietude. The consequences of this impediment to the necessary intestinal revolutions, are sometimes still more important and distressful; and in the warmer climates, may speedily prove destructive. Febrile affection, enteritis, colica stercorea, dysentery, &c. &c., are some of these consequential misfortunes. The medical officer, and all others concerned in the support of health, should, therefore, upon every proper occasion, admonish the people about the propriety and necessity of keeping the bowels regular; or rather—what in overcharged constitutions should be preferred, and especially upon entering a warm clime—to procure repeated discharges diurnally, without hesitation, and without reservation. A suitable attention to this subject, in combination with the moderate employment of alimentary substances, and temperance in the use of ardent spirits or vinous liquors, and a complete and grateful performance of the digestive operations, and the avoidance of protracted insolation, will all be found inimitably beneficial.

XCIX. This subject, indeed, appears of such moment, and so strikingly manifested to all who have had opportunities for observation, that here some additional reflections upon it may not, perhaps, be deemed unseasonable, inconsistent, or impertinent. If the suggestions and instructions are supported by the evidence of faithful and industrious observation, they are both appropriate and justifiable. But what is both a displeasing and distressing consideration, to all those who are peculiarly and responsibly entrusted with the management, is the offensive and blameable disregard and remissness of most of the persons subjected to these incommoding circumstances. This conclusion is applicable both to common sailors and others, which latter would naturally be expected to have an inclination to a more reasonable behaviour, and a less prejudicial mode of management. In tropical climates, imprudence, irregularity, and intemperance, kill more Europeans, than all the horrible engines of warfare, in complicated aggregation. After the experience of so many years, this disastrous occurrence would, it might charitably be hoped and expected, be converted by the survivors into an admonition and argument, favourable to amendment of life, and the perservation of temperance inviolable.

"Temperantia est, quæ in rebus aut expetendis, aut fugiendis, rationem ut sequamur monet."—"Temperantia est rationis in libidinem, atque in alios non ratos animi impetus, firma et moderata dominatio."—"Temperantia sedat appetitiones." And it ought to be duly considered, that the number of British subjects continually proceeding into foreign, (and therefore from the description of their communications, intercourse, &c.) and frequently into the warmer climates, is even, when moderately calculated and compared, extensive. This circumstance then implies those people occupied for seafaring purposes, and whether these may originally be commercial or defensive; and, moreover, those proceeding with the intention of becoming residents in the tropical or other scorching climates.

c. Prudential regulations to these latter are particularly applicable; their attention cannot be too pointedly directed to subjects in which the protection of their health, and all the comforts which this last includes, are more peculiarly interested. Of these, the commendable regularity of intestinal evacuation, can, in many of these settlers, be greatly promoted and maintained by a judicious dietetical exhibition; the regulation and proportion of which must be determined and conducted by the instructions obtainable from the experience of individuals. This insinuation, it will be understood, presupposes an inequality and dissimilarity in respective constitutions; so that each person may have a particularity, requiring a correspondent difference of management. And this observation may be made,—that if he possess even moderate intelligence, he must understand, and regulate, in a more correct and useful manner, his own personally applicable treatment, than by the assistance of any ordinarily imparted instruction. For these adventurers an advantageous and beneficial consideration is, the agreeable multiplicity of fruitage produced in the tropical climates, which is often so suitably and gratefully calculated for securing a free state of the bowels, in some constitutions. These articles, but especially those containing a considerable proportion of the saccharine principle—such, for example, is the plantain, although commonly and undeservedly despised—should be occasionally used, in quantities adequate to the desireable purpose.

CI. Another favourable occurrence to many in these countries, is this, that after accommodation to new circumstances, the progressive disposition to, and conclusive establishment of, intestinal regularity. This consequence, indeed, is one of those happy and salutary alterations occurring in constitutional qualification, which contribute, so powerfully, to the preservation of a tolerable share of health and comfort. This observation, it will be immediately apprehended, is not to be considered as constantly and universally applicable, and perpetually acting to the conservation of every individual, in these unfriendly latitudes; the opposite of this supposition is too frequently and injuriously remarkable. This last circumstance is so true, and so productive of mischief, that some persons, while they continue in the warmer climates, for this very reason never enjoy perfect comfort and health; but as soon as they regain the cooler regions, or their native country, &c. they likeways pleasingly recover their intestinal punctuality, and, forthwith, their desireable and formerly accustomed proportion of healthiness. These reflections should constitute memorable rules of conduct with all settlers in those countries, if they are inclineable to the preservation of constitutional healthiness. They, however, awkwardly, carelessly, and inexcuseably, slight or overlook some or all of the admonitions, and regulations, and proposed measures, which would be so conducive to their temporal comfort and welfare. This inattention and disregard too often originate in disdainful confidence, and an unreasonable presumption and trust in the inexhaustible durableness of their constitutions; and in this foolish and stubborn manner, how many British subjects have fallen sacrifices to their own imprudence and rashness! There are others again who, equally neglectful and inconsiderate, rush into misfortune and destruction with open eyes; because they must "follow the multitude to do evil," and are obsequious to the governance of their own unbridled appetites and unrestrained propensities.

CII. A number of plethoric and vigorous persons, who, on entering a warm climate, are probably disposed to inactivity, and who have hitherto been accustomed to swallow copious quantities of aliment and spiritous or vinous fluids, continue this hurtful practice, even after their arrival in the tropical and inflamed latitudes. If these people consulted their own safety, and studied the avoidance of evil, they would, carefully and cautiously, adopt and pursue a different plan of conduct. But many of these thoughtless persons, whose god is their belly, and whose summum bonum is the indulgence of their appetites, sooner or later insure to themselves the gnawings of remorse, the hesitation and insecurity of fluctuating expectation, and the tremendous forebodings of a prematurely accelerated termination of a life spent in sensuality and wickedness. A qualified reduction of the quantities of flesh, spirits, wine, &c. should therefore be instantly employed, by all those requiring such precaution, upon approaching the foresaid latitudes. The substitution of a necessary proportion of vegetable substances, will then be both adviseable and beneficial. Although this advice, and conduct ensuing, are suitable to many, yet some discretion is necessary in the management. It would be improper to introduce too extensive a proportion of systematic depression, by an injudicious diminution of nutrimental allowances. An acceptable liveliness, and apparent or rather indubitable possession of unaffected, undisturbed firmness and durability, promptitude for undertaking, and perseverance in performance, will be manifestations of the convenient adjustment. And as promotive of the general intention, sheltering under coverture in the heat of the day, when this is practicable, will be found advantageous. If continued or violent exercise is undergone, in the fatiguing, exhausting, and overcoming influence of intense solar blaze, there should be a prejudicial augmentation of superficial transpiration, the state of the bowels may thus be seriously, although indirectly affected. This condition of the surface is oftentimes, unfortunately, one of the most predominant and intractable causes of costiveness. The coolness of the mornings and evenings should, therefore, be diligently employed for the purposes of exercise; for, on the contrary, indolence and inactivity are likewise frequently causes of the same inconvenience.

CIII. And, while commenting shortly on this subject, it may further be mentioned, that some seafaring people, when altogether confined to the use of such articles as are generally furnished for marine diet, are often incommoded with the consequences of this deficient discharge from the intestines. This circumstance, even although happening in the temperate latitudes, is commonly not so immediately or extensively generative of particular mischief; but this is an imperfection, which, in these, may be productive of troublesome effects, and these either more instantly or remotely consecutive. This is a state of things always demanding attention; for often through carelessness, inadvertence, or misunderstanding, it gradually induces an infringement of constitutional healthiness, which is, often for ever after, a source of annoyance, and in itself irremediable. In many of these cases, the liver at last becomes affected; first in its particular and idiopathic functions, and afterwards in its structure, which is very composite. Disturbance, imperfection, and irregularity of digestion, succeed; and then the most important and attractive indications, are those which are more commonly pertaining to dyspepsia, and easily mistaken by those unacquainted with the complaints of tropical climates. Universal leanness, weakness, lassitude, become remarkable, and insalubrity is shown in the complexion, a combination of pallidness and sallowness is conspicuous, and the person appears dispirited. Continuing all these important changes, the real exciting cause is perhaps never suspected, and, excepting by some accident, continues unremoved and uncontrolled. In this manner, a mischief, at first expeditely superable, becomes the foundation of a host of anomalous and vexatious symptoms, and unpleasant sensations; or probably takes on the semblance of other dreadful disorders, and which are, too frequently, considered the offspring of a different and hitherto unassigned parentage.

CIV. Blood-letting has been commended for youthful fellows, upon approaching or entering tropical climates; and calomel has also been indeterminately, and consequently imprudently and inconsistently, prescribed, by other smatterers and empirical dogmatists in the profession. As these are propositions —and seemingly delivered with an impudent air of authority—which may fall under the dispensation or administration of some, who, correctly speaking, are unqualified for scientific and applicable determination, a few observations upon the subject, may not seem to be superfluous. The first, then, should seldom or never be performed, from merely the unmeaning and irrelevant supposition, that it may be beneficial, and that it will be preventative of undiscovered, but subsequent complaints. This sort of reasoning is, generally speaking, injudicious and inaccurate; and the practice thereupon instituted, almost constantly improper, and frequently materially detrimental. The harmless performance of phlebotomy will frequently require the most attentive observation and calculation, and its justifiable and appropriate employment the discrimination of the most experienced; and the propriety of its use, or even the probability of its usefulness, as a preventative, almost universally problematical. The injudicious performance of venæsection amongst a ship's company, or recruits, merely because they are entering a tropical climate, would be most preposterous and unjustifiable. A lancet, in the hands of a young man of a sanguinary disposition, and just come from a dissecting school, is to be considered a formidable implement. Phlebotomy, for the sake of actually precluding dangerous consequences, is perhaps not adviseable or necessary twice, or even once, in a thousand instances. Under the impression of the approach of imperious and immediate necessity, the affair is certainly then rendered peculiarly different; and then there is room for the interference and employment of the judgment of the practitioner.

CV. The exhibition of the second remedy mentioned is unnecessary, unscientific, excepting, occasionally, either separately or conjointly, as a purgative. The submission or subjection of every man proceeding into the warmer climates, (a whole regiment of youthful and vigorous fellows, for example,) to its systematic influence, is unmeaning and empirical, and must be considered particularly objectionable. The proposition deserves the most determinate condemnation, and the proposers the most consummate reprobation. The endeavours intentionally administered for the preservation of their healths, must be conducted upon more explicable and reasonable principles, which every practitioner, of an enlightened understanding, will immediately comprehend, and consequently regulate their application with discernment and proportionate usefulness. In these situations, all the regulations so particularly applicable, and which have, in some measure, already been, but shall hereafter be more amply delivered, might be found advantageous. The suitable management and employment of all these instructions, in their distributive qualifications, in the hands of an intelligent and attentive commander, and of an ingenious and accomplished practitioner, will insure—no circumstances of a particularly unfavourable denomination embarrassing—a very fair proportion of healthiness and serviceableness. And again, it may be said, that the propriety, or rather necessity, of a careful observance of the physical disparity or inequality of constitutions, cannot be too strongly inculcated with the professional man in attendance, and too constantly maintained.

CVI. The alterations continually, (sooner or later) but sometimes unperceivedly and accidentally introduced, are governable, in their quickness or slowness, greatness or smallness, by constitutional particularity; but the true bent of which is ordinarily incalculable. Some individuals, for instance, can endure a temperature of 80° to 84° without perceptible inconvenience or uneasiness, and even although previously unaccustomed to such an augmented impression. Others, again, upon experiencing such circumstances, suffer important annoyances and disturbances, and are vexed with irksome and irregular feelings, which generally subside and disappear upon the removal or separation from these causes of the incommoding consequences. This unlikeness and disproportion of constitutional susceptibility cannot be too carefully and completely investigated and ascertained; as a knowledge of it may lay the foundation of a favourable or unpropitious prognostication. There is a constitutional temperament, or rather idiosyncrasy, which, physically and inevitably, predisposes some individuals, under even an inconsiderable complaint, to gloominess and fearfulness. This particularity of constitution is often strengthened, or otherways determinable, by the nature of the more predominant circumstances of the possessor's peregrination, and by the person's own mode of management.

CVII. The restoration of those who are given to silliness and despondency, from any illness, will generally be found tedious and troublesome. The man who happily possesses liveliness and confidence, with even a moderate share of fortitude, ordinarily vanquishes difficulties with comparative facility; whereas, by the man of opposite character, they are perhaps considered as indomitable. Encouragement to the disconsolate and melancholic will, therefore, constitute a matter of remarkable importance, for the preservation of their health, or in the mitigation or removal of their diseases. A lumping fellow, apparently occupying uncommon strength and durability, if faint-hearted, will droop when affected with disease, beyond the probability of all supposition and computation. Propping the unsteady or tottering, and comforting and upholding the fearful and hopeless, will be always commendable and advantageous. Seamen, as formerly observed, after encountering a difficult and protracted voyage, or lengthened, and therefore a commonly unpleasant cruise, will often be influenced very peculiarly, in their character, and deportment, and usefulness, by the uninterrupted application of the accompanying annoyances. A continuation of these circumstances frequently induces a singularity of temperament and disposition, which afterwards holds pertinaciously, and sometimes unchangeably. The miserable sameness of circumstances—for even the savage roams for change of place and scenery—in conjunction with confinement, and anticipations occasionally disappointed, are in every state of life, sooner or later, disagreeable and discouraging to all humankind. But, in minds uninformed and unqualified by the precepts of a wholesome and beneficial education, these evils are still more invincible and destructive. An interchange of circumstances, to even the vulgar and untutored seaman, in these instances, will commonly be serviceable. The performance of a voyage, or the fulfilment of a doubtful or hazardous enterprize, will, almost certainly, superinduce exhilarating consequences.

CVIII. The vessels employed for mercantile purposes, continuing warfare, especially, when the Royal Navy requires the ablest seamen, are generally supplied with people of indifferent physical capabilities. They are constituted of an assemblage of wanderers, from different quarters of the habitable globe ; a compound of discordant tongues and languages. The surgeon in attendance would require to be in possession of the knowledge of a diversity of languages, to comprehend these grotesque fellows, in their incongruous and multifarious phraseologies. All these, and many others, at the commencement of a medical man's peregrinations, frequently constitute causes of considerable inconvenience. A multitude of other circumstances necessarily come within the apprehension of the intelligent practitioner, and which will always, in his estimation, be of moment, in drawing his preventive and practical conclusions. He should attain, progressively, such a comprehensive acquaintance of the persons forming a ship's company, as to be able to anticipate, or at least immediately to recognize, the most inconsiderable departure from their accustomed appearances. The dissimilitude, or rather incongruence, of constitutional susceptibilities—the actual condidition of health—or oppositely, of the inclination to, or evident formation of disease—and, what is likeways of material interest, the mental faculties, as far as they may be developed in ordinary occurrences,—will also be taken into the calculation. A collective examination will be found wonderfully beneficial, in instituting prophylactic determinations, as subsequently and respectively applicable to individuals. The reciprocal action of body and mind, has been a circumstance challenging attention in every age, in every clime; but notwithstanding all the scrutination of intellectual philosophers, the subject still lies in the concealment of darkness, impenetrable and irremoveable. The susceptibility or remissness of imagination; the constitutional temperament; the prevalence of particular examples in childhood, &c.; the unrestrained enjoyment and indulgence of profligate or worthless inclinations; the instability of their mode of occupation; the irremediable wickedness unfortunately disseminated amongst them, in a state of accumulation and unreasonable confinement, and closely rivetted by the complication of association; the continuation of rudeness; the consequence of imperfect education, or, what is, perhaps, more lamentable, the total want of such a qualification: all these should be taken into consideration. The dispositions, too, are often imperceptibly and progressively altered by numberless circumstances, whether physically, ceremoniously, or religiously operating, they undergo a modification by accidental and extrinsical impressions, all requiring consideration in proportion to their diversified intensities, either in the preservation of their health, or in the treatment of their complaints.

CIX. These inculcations and expostulations will, seemingly, to those overgrown with laziness and carelessness, be propositions of supererogation; but in the discernment of the judicious and intelligent practitioner, their importance will be immediately and adequately appreciated. This apparently intuitively operative comprehension and discrimination, will be attainable by the man who fights for the prize, by the man of clearness and capaciousness of understanding and indefatigable perseverance, and possessed of that diligence in his profession, which lays the steadfast foundation of application, and that honourable wish for excellence which will ultimately be crowned with proportionate recompence. The conscientious practitioner, therefore, should investigate the natural qualities of all those under his medical guidance. He should determine the more remarkable deportment of every individual. Their ordinary personal gestures should be calculated, the tone of their voice, the general condition of their visage, should be expressly understood; the mobility, the rotundity, and fulness, the clearness of their eyes, must also be considered. The colour of the lips, the cast of the complexion; their apparent or absolute magnitude, or literally speaking, cubical measure, abstractedly considered, their firmness or softness, their comparative hardiness or delicateness, and a thousand other observations will be made by the attentive and scientific practitioner. He is, after all this preparative knowledge, (for such it may be denominated,) more suitably qualified for ascertaining the deviations from health, and therefore the accession or evolution of disease. When he is in possession of these informations, he is also equipped for developing and gainsaying imposture, to estimate the proportion of declination from the antecedent, or natural standard of health, and the most adviseable mode of management. In the Public Services, these undoubtedly are considerations of unspeakable importance; for often, in proportion to the acuteness of the practitioner's investigation, the number in his report may be diminutive or extensive. The unmasking of falsification, the developement of disguisement, should be regularly and duly followed with exemplary chastisement. A resolute and unyielding opposition to all these flagitious properties, at the beginning, will commonly be preventive of their frequent repetition. This part of medical natural history, has not been sufficiently regarded in the practice of medicine, or preservative administration. The youthful practitioner must, therefore, be circumspect; and if his lot is cast amongst soldiers or sailors, he will find this preparative qualification, which has been so strenuously recommended, to be singularly advantageous.

CX. The consideration of the almost inconceivable multiplicity of circumstances, and occurrences, and exposures, continually affecting the seafaring, would lead into an amplitude of disquisition, completely inconsistent and unnecessary. A few concluding and compendious observations, therefore, upon some important circumstances in relation to the management and preservation of health, shall here be subjoined. These reflections will include a reference to both the preparative, and conservative administration. And as the medical officer will frequently have to determine on the capability of individuals, it thus seems indispensably requisite, that he should be, competently, in possession of all obtainable professional knowledge. A commendable accumulation of this honourable qualification, will give him consolatory encouragement and satisfaction, when he is called to struggle with difficulties which, at first sight, in all probability, might be hastily judged to be insurmountable. A primogenital soundness of constitution, a firmness and deliberate coolness, with a sufficiency of instruction grounded thereupon, will be inconceivably serviceable upon some of the most dreadful emergencies. As this is a consideration of the greatest importance, some additional observations are admissible; but, as lately hinted, the subject cannot here undergo a complete and satisfactory examination. The following considerations may, however, be propounded. A man, who professedly and deliberately undertakes the healing art in all its dependencies, involutions and difficulties, participates voluntarily and necessarily in the most considerable responsibility, and of the real importance of which, those only of conscientious dispositions, and illuminated understandings, have a proportionate comprehension. The medical man, therefore, who is actuated with honesty of principle and integrity of conduct, will diligently and studiously prepare himself for the honourable performance of the duties of his profession. He must likeways be prepared for encountering the difficulties and distresses, frequently concomitant upon the execution of his employment. Possessing an unsuspecting confidence in the uprightness of his principles, and the sincerity of his intentions, and also of the faithfulness and usefulness of his carefully and diligently earned acquirements, he disregards all inconsiderable embarrassments, and the ordinarily encompassing annoyances, (which indeed every candid observer must be perfectly convinced, are inseparable from a life spent on shipboard,) are also continuately vanquishable by his magnanimity and perseverance. In the comfortable possession of illuminated intelligence and discrimination, he keeps the undisturbed maintenance of a complacent deportment, and is apparently submissive, inoffensively, and with philosophic qualification, to the unavoidable contingencies of circumstances.

CXI. This resemblance of accommodating condescension, must be modifiable by the nature of concomitants; for he oftentimes experiences (unless he is a very lucky man) grossness and rudeness of behaviour; but it is sincerely expected, without the possibility of contamination. This complaisance, as long as irreproveable, is commendable, but it must not degenerate into silliness, or unnecessary submission to the ungenerous and indignabund; this inexpedient meanness and lowliness would be insufferable. The honourable and scientifical practitioner should be perpetually independent of, and unassailable by, those who are frequently unfriendly; and by the unjustifiable animadversions of ignorance, and its ordinary, but intolerable companion, petulance or pervicacity. He should continually maintain a respectable, estimable, and commanding deportment. He must be given to retirement, to meditation, that he may seasonably prepare himself in the commendable acquirement of knowledge. Nam, "Nulli clari viri medicinam exercuerunt; donec majore studio literarum disciplina agitari cœpit. Quæ ut animo præcipue omnium necessaria, sic corpori inimica."—"Eum vero recte curaturum, quem prima origo causæ non fefellerit." Instead of negligence, and wasteful and deceitful idleness, he will frequently be carefully furnishing and confirming himself, with every practicable and attainable information in his professional department. The accomplishment of these desireable purposes will be deriveable from a suitable rudimental education, industrious application, distinctive observation, reasonable conclusions, and subsequent scientific and judiciously distributive professional management. He must, like the venerable Hippocrates, endeavour to investigate nature in all her movements, and to him, apparently, perplexities, which is a proposition requiring for its fulfilment that meekness, mildness, steadiness and perseverance, which are so very infrequently remarkable. The application of the exhortation, however, is considered indispensable, to all those, who wish advantageous expertness in their profession. He must investigate her in all her prodigiously multiplicated circumstances, and be able, from his observations, to make some determinate conclusions; otherways, his treatment must be the doubtful result of irresolution, or the displeasing consequence of misconception and misapplication. The fulfilment of this undertaking necessarily asks clearness of understanding, promptness or quickness of apprehension, and frequently immediate and appropriate administration. These are requisites, highly commendable, and fundamentally comprehend what may, etymologically and unconditionally, be called indispensable qualifications.

CXII. The foundation of these professional qualities must be laid in nature; this is a consideration as incontrovertible as a mathematical demonstration. This primogenial and prerequisite qualification, singularly, will, however, undoubtedly be insufficient —a professional instruction, thoroughly conducted in all its subdivisions, will also be necessary. This must also be accompanied with an attentive observation and distinction of diseases, and their most approveable and effectual treatment—these will constitute the probability of establishing the most advantageous professional knowledge. If his destination (as the tendency of this discussion implies) is a sea life, a moderate experience will unfold the nature and amount, of the more commonly prevailing inconveniences of shipboard, and the odiousness or indifference of their impression, will be regulated by a previously unexpected multiplicity of circumstances, not here needing specification. A firmness but correctness of determination, a contempt of all lesser annoyances, a greatness of mind, rising with deliberate steadiness in opposition to indifferent occurrences, will be serviceable in mitigating or moderating the primitive influence of objects, which, without such procedure, might be disagreeable. The surgeon engaged in marine practice, should bestow particular attention upon the exploration of the originally designating symptoms of particular complaints. This information is an acquisition of remarkable importance in the practice of medicine, but is only the reward of unwearied industry, clearness and fairness of judgment, and appropriate illumination of understanding. When he fortunately possesses these inestimable properties, by indomitable perseverance he will surmount what, to the superficial or uninformed, may appear impossible. The aforesaid suggestions are, principally, but not exclusively, referable to examples where diversified symptoms exist, but which do not, concurrently and collectively, characterize specifically and essentially different complaints. In these instances, sometimes by originally accidental association, by continuation, aggravation, and other innumerable circumstances, the phænomena are so confusedly intermingled, that it is with the greatest difficulty that the particularly expressive symptoms of respective complaints are intelligible and ascertained.

CXIII. The practice of medicine, therefore, in its several divisions or branches, is a subject implying considerations of momentous concern. In these, the reputation and happiness of the practitioner, and the safety and welfare of the patient, are often very peculiarly interested. The mind of the thinking and upright surgeon is incessantly and anxiously employed. The difficulties, whether originally subsisting, or gradually displaying themselves to his observation and management, in different disorders and casualties, frequently require elaborate attention, and cautious but decisive treatment. It is perhaps allowable, and certainly reasonable to say, that the marine surgeon should have his mind stored with every acquireable professional accomplishment. He may often be so situated, that the consultation, and collateral assistance of his brethren, are not procureable. He is, moreover, even frequently without the aidance of an intelligent coadjutor. In the Navy, this deficiency and imperfection of chirurgical assistance, was lately a mischievous inconvenience; but by improvements and concomitant advantages opportunely introduced, this evil has undergone a considerable diminution—at least, by the numerical augmentation of practitioners. The qualifications of many, however, are very questionable; their elementary and fundamental education frequently very shallow and imperfect, and the course of their medical studies short, hurried, and ill conducted; and thus, if they are capable of answering some ordinary questions, they are regularly advocated to the profession. The marine surgeon must be considered as a general practitioner, or one whose employment occasionally comprises every part of the profession, in the most extensive state in which it can be contemplated. He should therefore have a universality of professional knowledge; he should be equally qualified in the particulars of every branch of his undertaking; and this supposition embodies a share of attention and assiduity, of remarkable amplitude and consequential importance.

CXIV. If he is thus physically, artificially, and after some time it may be said, practically prepared, for the duties of his department, their discharge will be rendered tolerable, or rather for the most part agreeable. He will overcome apparent difficulties with unexpected readiness, and will meet accidents with firmness, coolness, and composure, which in emergencies will be found incomparably advantageous. In possession of invaluable qualifications, he will enjoy that consolation, that happiness of disposition, and those comfortable and encouraging expectations, which shall to him be a foundation of undisturbed confidence, and satisfaction unassailable. And this remark may be made, "that notwithstanding these happy effects of a virtuous life, the principle of Duty and the desire of Happiness are radically distinct from each other. The peace of mind, indeed, which is the immediate reward of good actions, and the sense of merit with which they are accompanied, create, independently of experience, a very strong presumption in favour of the connexion between Happiness and Virtue: but the facts in human life, which justify this conclusion, are not obvious to careless spectators; nor would philosophers, in every age, have agreed so unanimously in adopting it, if they had not been led to the truth, by a shorter and more direct process, than an examination of the remote consequences of virtuous and of vicious conduct."

CXV. As contributing to the preservation of healthiness, as far as physically practicable, among seafaring people, another circumstance of essential interest may be mentioned; and which is this, that an accommodating understanding betwixt the practitioner and commander, is at all times particularly commendable; or rather, for the complete performance of every necessary and collaterally aiding duty, seems indispensable. An harmonious accordance and reciprocal confidence should here be perpetually maintained. A commander should listen to the suggestions or proposals of an intelligent surgeon, and not, with unbecoming arrogance, bombastic impudence, and preconceived sufficiency, disregard his commendations, in all matters which he has earnestly considered as intentionally conservative. A surgeon of this description will never unnecessarily, never unreasonably recommend any plan, but will have previously, as far as practicable, ascertained its propriety, and also the likelihood of its usefulness. As it has been already concluded, that the medical officer understands his department thoroughly, his advisements of specifically applicable management will, therefore, become more particularly acceptable. In the governance and employment of the considerations concerning air, food, clothes, and cleanliness, his observations or conclusions should never be overlooked, as contemptible or insignificant. Some commanders are so inveloped with disdainful ignorance, and, at same time, surcharged with fanciful competency, that they sometimes both dogmatically and ungenerously contravene the practitioner's wholesome instructions, however reasonable and convenient in their nature, and profitable in their application and consequences. The prevalence and entangling influence of custom, upon some of these occasions, is peculiarly observeable, and that unsanctioned obsequious subordination to the deceitful and frequently misguiding force of preceptive ordination. "Sed quia interim excusantur hæc vitia aut consuetudine, aut auctoritate, aut vetustate," &c., should, also, themselves be deemed inexcuseable. Petulant ignorance, when unluckily and undeservedly in preferment, is too dangerous an instrument to be permitted to reign unreproved, or even unrestrained. On these occasions, the surgeon should constantly make a faithful recordation of these unpleasant, and to him unfriendly occurrences, in his itinerary. And these animadversions should never be neglected by those who legitimately, and by constituted authority, act as investigators or superintendants. The enlightened and reasonable commander will, always, deliberately consider the propositions of the practitioner in attendance; and when the conservation of health, &c. are immediately implicated, will accordingly determine.—Ascribable to the scientific suggestions of practitioners in His Majesty's Navy, and the acquiescence, approbation, and concurrence of generous and gallant commanders, and others in authority, are the excellent and numerous amendments, and subsequent advantages, at this day in the navy so remarkable. These improvements have all been beneficial in the preservation of health, and consequently effective strength, complacent obedience, and consentaneous willingness in performance.

CXVI. As observed at the beginning of these preliminary observations, navigation is conducted for three principal and important purposes; the first, for obtaining necessary subsistence from the watery element; another, in the prosecution of commercial undertakings; and the last, with warlike intention; designedly for aggression or repulsion, &c. In countries which depend virtually or materially upon commerce for their maintenance, or aggrandizement, the management of navigation, and those men who are requisite for its performance, will, apparently or impliedly, be considered of unspeakable consequence. In merchantmen, however, there are no authentic regulations, which are constantly observeable and inviolable, for the preservation of those kept in employment. In the vessels employed in one of the greatest mercantile companies in the world, manifold blameable and prejudicial imperfections are allowed to operate unrestrained; and if so amongst those which ought to be exemplary to all others, what is naturally to be expected in the obscurer concerns of individuals? Conclusions of an opposite description, are commonly applicable to the ships employed for warlike defence. For, in these vessels it may be said, the advantage of all embarked constitutes a noble part of the superintending administration. The particular application of the appointed regulations and ordinances, is no doubt modifiable, in some measure, by the particular disposition and judgment of commanders, and also by the nature of circumstances; but still, in the Public Service of a powerful and flourishing nation, there are always subsisting a distinctness and strictness of management.

CXVII. Amendment neither in the commercial nor in the belligerent department of navigation, has, however, reached its summit; but is still susceptible of enlargement, and more determinate application. An animating expectation is earnestly entertained, that the good work, which has so beneficially commenced, will not be inefficiently relinquished; but progressive improvement be steadily supported, until it terminate in the most satisfactory accomplishment. The forementioned commendable and serviceable intermutual agreement, betwixt surgeon and commander, is likeways supposed to exist in the distributive and prophylactic administration. The rational and informed surgeon, being thus encouraged and supported in the discharge of his profession, will feel his duty easy; and every circumstance of the universally applicable prophylaxis, or conservation, being thoroughly maintained, his sick-list will generally be short, and consequently the absolute strength of a ship's company be proportionate. The gallant, the amicable, the generous commander, will continually have the agreeable manifestation of unexampled healthiness, and the comparative happiness of a submissive and confidential ship's company. This cheerful and quickening confidence, pleasingly reposited in the belief, of a careful attention to the defence and protection of their comfort and welfare, will operate powerfully every where in the prolongation of their health and usefulness. The remembrance of these kindnesses will, moreover, constitute one of their most acceptable encouragements in the day of battle and decision. The sagacious commander, for all his kindness and discriminating interference, and the professional cleverness of the practitioner, will consider himself abundantly recompensed by his superiority in the day of hostile and decisive engagement. By a judiciously proportioned discipline, and scientifical professional administration, the people will both fear and love their commander, and also respect and befriend their surgeon. An agreeable and systematic unanimity once introduced, and thoroughly maintained by regulating authority, the generality of them will be cheerfully obsequious to the particular institutions which may occasionally be put in enactment. A beautiful organization thus once in appointment, and perfectly completed in all its particulars and dependencies, will approximate the nearest to obtainable satisfaction; and proportional confidence may be placed in its advantageous subserviency, and the acceptable employment of those more intimately concerned, will be its unimpaired preservation.

"Cœlum, non animum, mutant, qui trans mare currunt.
Impiger extremos curris mercator ad Indos,
Per mare pauperiem fugiens, per saxa, per ignes."

———" navibus atque
Quadrigis petimus bene vivere."

———" qui miscuit utile dulci,
Lectorem delectando, pariterque monendo."

———" vitavi denique culpam,
Non laudem merui."

CHAPTER SECOND.

ATMOSPHERE.

PRELIMINARY OBSERVATIONS.—DESCRIPTION OF SOME OF THE PRINCIPAL PROPERTIES.—COMPOSITION.—TEMPERATURE. — PURENESS. — DEFILEMENT. — SOME CONSIDERATIONS UPON ITS RELATION AND INFLUENCE UPON THE HUMAN CONSTITUTION, &c. &c.

> " And when I was born I drew in the common air."

1. THE air, or atmosphere, as it is now in English oftentimes denominated, is absolutely requisite to the performance, and consequently the beneficial purposes of respiration ; which latter function is almost invariably and constantly necessary to all creatures. As the atmosphere is incessantly requisite for the foresaid purposes, so likeways is it peculiarly influential, by its modifications and impregnations, in the preservation of healthful, or the introduction of distempered constitution. Every natural observer is sufficiently acquainted with its indispensable usefulness in supporting the vegetable kingdom. These are considerations of the highest importance, and are immediately and perpetually applicable to mankind, as comprehended in all their accompanying circumstances. And, accordingly as the remissness or intenseness of these atmospheric qualifications, may be beneficially or injuriously remarkable,

their agreeableness or inconvenience will be, in some degree, proportionate.

II. The atmosphere, therefore, including some of its more particular properties, necessarily becomes a subject of investigation, previously to the other matters of examination in the subsequent disquisitions. Every person who depends on the continual performance of respiration for his temporal existence, impliedly or professedly understands, that the common air is an indispensable intermedium for the continuation, and enlivening influences, of this animal function. Mankind, it may be observed, are perpetually dependant on manifold physically necessary circumstances, but which, in themselves, by human power, are incontrollable and unalterable. The atmosphere—comprehending it with a multiplicity of its impregnations, and as the medium of communication for other subtile, and many of them invisible agents—may justly be considered as one of those powerfully operative, but unmanageable substances. The most indubitable proof of life, or reviviscence, is the inhalation, and exhalation, of the atmosphere. This elementary substance is essentially and absolutely necessary to breathing animals. This fluid excluded, or so depraved in its qualities as to be unfitted for supporting respiration, and its concomitant advantages, all other considerations are unavailable.

III. And, as lately said, the atmosphere is likeways necessary to the vegetable constitution, continuation, completeness, and reproduction, and even for their decomposition; but as this has no immediate reference to the subjects more strictly under discussion, its examination would, therefore, be superfluous.—The atmosphere would, in all likelihood, be first demonstrated to mankind, when in the state of movement. It is not necessarily supposable, that it was manifested to them, by its employment and application in the performance of respiration. This operation might be accomplished, by the interposition of this invisible and impalpable substance, without the consciousness of its subservient administration. This conclusion, therefore, which is verisimilar, indirectly contributes to strengthen the forementioned supposition.

IV. Substances, which are ascertained by some of their more conspicuous or remarkable properties,have successively got appropriate denominations. Man, from his instinctive propensity to the acquisition of knowledge of those circumstances which may not previously have been submissible to his investigation, is also, from this consideration, fond of imposing particular, but often incongruous designations. These distinctive characters, when judiciously appropriated, are convenient in the progressive propagation of human knowledge. They are to be considered as the symbolical denotations of particular substances, and also occasionally comprising some of their expressive individual properties. These appellations, therefore, are serviceable in the advancement and communication of human knowledge, and in being declarative of the characteristic circumstances of discrimination, and attribution, of respectively applicable qualifications.

V. These abstracted notifications, although constituents of philosophic knowledge, not being particularly advantageous to this subject, their consideration shall not be prosecuted. These short notes on the nominal essence of things, were deemed adviseable for clearness in logical reasonings, and without some nomenclature, confusion would supplant, and become distinction's vicegerent; and the communication of knowledge would be impracticable. The appellation *atmosphere*, the generally employed term for the subject of examination, when its etymology is sufficiently apprehended, may serve as an illustration. It appears that the original, or first conceptions of mankind, concerning the atmosphere, determined it to be an elementary or simple substance. As a separate and peculiar body, it has been considered even from the remoteness of antiquity. And conformably to the forementioned propensity to designate substances, with all their conceivable or ascertained properties; and also their adventitious circumstances, or very frequently from some singular or unmingled property; it also obtained a specifically descriptive appellation. And this, if any confidence be attributable to etymological determinations, was derived from its moveableness, or rather susceptibility of fluctuation.

VI. In the Hebrew, which was the original language of mankind, it received its denomination from the foresaid circumstance; אר, which radical word, translated into vernacular language, signifies to flow; and hence the word *Air*, which, from its heterogenious impregnations, is now commonly called the atmosphere. This primitive nomination, AR, passed through the Chaldaic, Syriac, and other Eastern tongues; was then admitted into the Greek; proceeded into the Roman or Latin; and, in a modified condition, disseminated and incorporated amongst the hodiernal European languages. In the generality of these it has maintained an unexpected resemblance to the original. This is even manifestly exemplified in the English language; and, in the Welch, *awyr* remains until this day; not remarkably dissimilar to the prototype. The English word *air*, therefore, is probably more immediately deriveable from the Greek word AHP, and this from AΩ, (infinitive αειν,) flare, spirare; which the philological philosopher will immediately distinguish to be peculiarly expressive. By the utterance of the symbols of the first person of the verb, with a prolonged and somewhat sonorous effort of respiration, it will be perceived, that the sound will be an "echo to the sense," or thing signified; it will be expressive of the whole process of respiration; the sonorous expression of the first character will represent inspiration, and that of the last expiration. This conclusion furnishes a beautiful explanation of the most important purposes this substance was always supposed to answer, and from which reasonable supposition, it has obtained, in manifold languages, a most characteristic and expressive denomination.

VII. Air, or atmosphere, agreeable to the conclusions of Hippocrates—who, it may be understood, had a very competent knowledge of the language employed by his countrymen—was considered the "spiritus corpus nostrum circumambiens eique circumfusus." The appellation was originally intended to denote the invisible fluid surrounding this terraqueous contexture. The air, in its multifarious modifications, received a variety of appellations, according to the different purposes it was supposed to answer, or the different alterations which it might accidentally have undergone. Πνευμα was applied when it fulfilled the purposes of respiration; it sometimes, however, expressed that portion collected or disengaged in the different hollows or cavities of the bodily structure. Φυσα, or φυση, signified the flatus or spiritus crassior, supposed to be commonly generated in the intestines, &c. These distinctions, however, are frequently confounded, and their application not accurately maintained; the conclusions, therefore, apparently obtainable from the statements of the ancients, are sometimes to be mistrusted. ανεμος was applied to the air in commotion; it is αεϱος ʽϱευμα ϰαι χευμα; aer fluens et fusus, or rather aeris fluxus fusioque. The enumeration of all the attempted distinctions would be useless, and shall, on that account, not be introduced.

VIII. Æther constituted another invisible, but wonderful aeroeidic substance; which they inclined to distinguish from air, and to which they attributed particular properties. The forenamed physician, after reckoning some circumstances, which he commemorates upon the authority of others, extends his view to celestial phænomena; at same time remarking, that they did not peculiarly or needfully come under his consideration, excepting in as much as they were concerned in the generation and formation of mankind and other animals. He confesses that the heavenly bodies have a peculiar governance over the animate creation; both in its production, continuance, and termination. He then communicates his own determinations concerning the subject; but these appear to have been drawn more especially from the knowledge of his predecessors. His conclusions, in relation to æther, may thus be translated: "What we denominate *hot*, to me appears to be immortal; to understand all things; to see, to hear, to feel, all things, both present and future. The greater part of this, when all things were disturbed, withdrew into the highest circuit; which I conceive the ancients called AIΘHP." The venerable physician thus appears attempting to describe something to which he wishes to attribute, or implant, peculiar qualities; but concerning the precise nature of which his conceptions were so indistinct and groundless, that he, unhappily, obnubilates his subject with words without knowledge. Æther was sometimes put for Jupiter himself; and at others for his more exalted residence. It was also more pointedly applied to that portion of the atmosphere, which was peculiarly subservient to the purposes of respiration; and hence the very emphatic expression, " Aura ætheria vesci," *to live.* From its inconceivable subtility, and liveliness, and fiery qualities, it was, moreover, employed occasionally to signify inflammation.

IX. This distinction of aer and æther, very commonly prevailed amongst the ancient literati; and with the Latins, who were the most refined and civilized of the inhabitants of the western part of the European continent, these two words were retained, to denote the atmosphere in its most extensive signification. Aer and æther agree, in a general relation, of being circumambient to the earth's superfice. The substance implied by air, however, is considered essential to animate existence, and is likeways more dense in its nature than æther, which is more remote, and with which it is thought it never can incorporate. The notions of the ancients, with regard to the height of the atmosphere, were, as might be expected, altogether gratuitous and indistinct.

The Roman Orator has supplied definitions wonderfully indicative of his matchless and penetrating judgment. " Terra sita est media parte mundi, circumfusa undique est hac animabili spirabilique natura, cui nomen est aer."

x. Concerning æther, the notions of the ancients appear more confused, and less determined, than those they applied to the common air, or atmosphere. The essential constitution of both was supposed to be subtilized air, as this latter was to be subtilized water. " Ex terra aqua; ex aqua oritur aer; ex aere æther; deinde retrorsum vicissim ex æthere, aer; ex aere aqua; ex aqua terra infima.' According to the Ciceronian philosophy, the remotest extremity of the æther constituted the termination or boundaries of the universe. An opposite sentiment, it appears, was entertained by Lucretius. According to his doctrine, no such extremity existed; because the "Ignifer æther," as he calls it, was supposed to keep pace with the immensity of space.

> " Fiet uti nusquam, possit consistere finis
> Effugiumque fugæ prolatet copia semper."—*Lucret.* i. 981.

The Orator declares, that the æther; " Restat ultimus omnia cingens, et coercens cæli complexus, qui idem æther vocatur; extrema ora, et determinatio mundi," &c. The continually, but irregularly, intervenient alternations of the conditional properties of the atmosphere, were more particularly observeable by husbandmen, and other inhabitants of the country: unfeigned Ruricolists, to you, naturally unpolished and even illiterate, simple Nature unfolded a multitude of her wonderful, beautiful, and sublime operations. With you, it is likeways probable, astronomy, meteorology, and the observation of the heavenly luminaries, commenced. "Principio Asyrii, propter planitiem magnitudinemque regionum quas incolebant, cum cælum ex omni parte patens atque apertum observaverunt. Qua in natione Chaldæi, diuturna observatione siderum scientiam putantur effecisse."

XI. A diversity of phænomena, either originating and revolving in the celestial expanses, or manifesting themselves on or near the terrestrial superfice, would become the substruction of speculative consideration and investigation, and thus lay the foundation of astrological and horoscopic calculations, which afterwards were so ceremoniously, confidently, and religiously regarded in the ages of antiquity. Conformably to these reasonable conclusions, they insensibly, but gradually, acquired some tolerable information and acquaintance of the variableness and other remarkable circumstances of the atmosphere, with their prognostications.

XII. The successive and determinate concatenation of seasons, the contemplation of the changeable appearance of the heavens, or ouranoscopy, among the ancients, were considerations for employment, and of memorable importance. The supposed unhealthy properties of the atmosphere were duly attended to by their physicians and philosophers, who, as soon as curative attempts were undertaken, for the examination of the causes of diseases, for their alleviation, or removal, anxiously considered the multifarious vicissitudes of the atmosphere; but, unfortunately, from the imperfection of their knowledge, these would, for the most part, be apprehended only in their consequences. These effects, however, suggested to them the propriety of carefully observing those circumstances which necessarily and inevitably affected their enjoyment or happiness. Practical conclusions were watchfully instituted, and, by the interposition of comparison and experience, were deemed applicable, according to the predominance of particular circumstances. These precautions were indeed judged so adviseable, that poetical faculty, prosaical admonition, and medical precept, were severally employed to introduce to observance the relatively applicable properties of different countries. The wholesome were presumptively distinguished from those regions which were concluded to be insalubrious; and therefore the poet says, "Dulcia arva,—ipsa volentia rura sponte tulêre sua,—nova per florea rura—O fortunatos nimium, sua si bonà norînt, agricolas! quibus ipsa, procul discordibus armis, fundit humo facilem victum justissima tellus." The lethiferous influences of the exhalations from infectious places were expressly and emphatically pourtrayed; "Spelunca alta fuit, vastoque immanis hiatu, scrupea, tuta lacu nigro nemorumque tenebris; quam super haud ullæ poterant impunè volantes tendere iter pennis: talis sese halitus atris faucibus effundens supera ad convexa ferebat." "Hoc autem nomen olim non peculiare huic loco, sed iis omnibus commune fuit, e quibus vapores halitusque erumpebant avibus pestiferi; seu lacus, seu cavernæ, campique essent: idque manifestum est ex Lucretio l. 6. 738." "Nunc age averna tibi quæ sint loca cunque lacusque." A multitude of observations concerning the variegated properties of particular countries or territories, are contained in the writings attributed to Hippocrates. And if it was necessary, an extensive enumeration of historical confirmations could be produced, from authentic documents, illustrating the operative influence of the atmosphere, with all its impregnations, both in the prevention and production of different complaints.

XIII. In the English language, the word Air is generally used to denote the whole invisible liquid by which the earth is surrounded. The theoretical distinctions of the ancients are therefore excluded from the present accepted meaning of this word; their "æther ignifer" being confusedly intermixed with the term atmosphere. This last appellation is of later formation, and from its etymological constitution, naturally implying a more extensive signification. The denomination seems to be deriveable from *ατμις*, or perhaps *ατμος*; the first signifying a a vapour, or cloud—chiefly the smoaky vapour arising from incense; and the latter denoting flatus halitus, &c., and *σφαιϱα*, globus, &c.—as expressive of the concentrical roundness of the atmosphere. In all improved languages, several names were applied to its various conditions; agitation, stillness, dampness, dryness, warmness, coldness, &c., and multifarious other circumstances. The characteristic appellation now appropriated is *atmosphere;* and which, as ordinarily employed in the English language, is meant to comprehend the numberless exhalations with which it is perpetually intermingling.

XIV. Pure air is possessed of the following properties and circumstances: It is invisible, inodorous, impalpable; its heaviness not perceptible, having a capability of expansion or dilatation, and of contraction or condensation, but whose amount is not determinable; it is colourless, transparent, changeable in its movements, by causes operating more immediately upon the atmosphere. The common air is modifiable, in its specific gravity, by the state of some of the forementioned qualities, but especially those of expansion and condensation; and these, as is conveniently understood, depending upon the absolute quantity of caloric with which at the time it may be incorporated. Undefiled air is inodorous, but this, it is supposed, may proceed from the continual perflation of it through the nostrils, by which, from the influence of subsequently established habitude, it is rendered incapable of producing the excitement of specific smelling. It appears a supposition supported by probability, that if recently produced animals could communicate their sentiments intelligibly, that they would acknowledge that the air, at the beginning of respiration, gave them a peculiar, separate, or distinct impression. The greatest number of the aeriform substances, and which are not naturally intended or commonly employed for the purposes of respiration, have an odour peculiar to themselves, but which commonly becomes diminished in its operation, according to the continuation and other circumstances of the impression, and which is sometimes, ultimately, not observeable. Air, in proportion to its expansion by caloric, is, cubically considered, diminished in its specific gravity, and reversely, it is augmented by its abstraction.

XV. Air, as formerly observed, is essentially requisite to all breathing animals, and this necessity appears to have been a subject of continual observation and knowledge. The ingenious Roman orator says, "aer vitalem et salutarem spiritum præbet animantibus." The context explains this suitable property to be obtainable, from its temperation with a convenient proportion of the heating principle. The influence of heat in expanding all substances, but more particularly of the atmosphere, has not passed, even with the ancients, unobserved. They made mention, also, of the different states of its more inseparable, or accidental properties. And for example the following; aestas, ardor, caligo, strepitus, &c.; aeris; or aer agitabilis, apertus, ater, calidus, crassus, densus, gelidus, humidus, liquidus, morbidus, nebulosus, niger, nimbosus, obscurus, pluvius, purus, roscidus, tabificus, tenebrosus, tepidus, vacuus, &c. &c., were with them descriptive adjunctives. The elucidation of this part of the dissertation by authoritative transcription, would be superfluous, and perhaps to some unintelligible. The inquisitive must institute investigations conformably to their wish, for the acquisition of knowledge in its multifarious ramifications.

XVI. It is naturally understood, that the ancients had no intelligence, no knowledge of the composition of the atmosphere; they considered it as an elementary substance, absolutely simple, or without adventitious complication. Their conclusions in relation to its altitude, were, unavoidably, gratuitously assumptive, but the prevailing supposition was, that it proceeded to an inconceivable and incalculable remoteness; and there, at this prodigious distance, "Jupiter tonans" was conceived to establish his celestial Domicilium. "Jupiter aethere summo despiciens mare velivolum," &c. The mechanical properties of the air were those first apprehended, and endeavours made for their explanation.

The continually diminishing specific gravity, and consequently the compression of the atmosphere, in proportion to its highness, appears to have been to them altogether unknown. It is now ascertained, that the decrease of its heaviness goes in a geometrical, while the highness proceeds in arithmetical progression.

XVII. From a collective examination of different passages in ancient authors, it may be understood, that they were in possession of some knowledge of part of the mechanical properties of the atmosphere, and of its capability of containing diversified exhalations, and these afterwards manifesting either salubrious or deleterious influences. The determination of the goodness or badness of the air of particular countries, or of the different parts of the same country, exercised the ingenuity and judgment of their physicians and statesmen. Hippocrates carefully enumerates and describes the physical properties which he considered serviceable or beneficial, and also the circumstances which were supposed to be occasionally productive of indisposition. The innumerable vicissitudes of the atmosphere, are attempted to be explained with seemingly considerable attention, and their effects upon the human constitution are not overlooked. The peculiarities of the earth's surface, whether originating from circumstances continually subsisting, or incidentally superinduced, by inundations, conflagrations, earthquakes, or the specific operations of peculiar seasons, &c., are all subjects of investigation. The variegated exhalations, vaporations, and miasmata, &c., which were supposed to be constantly circulating or intermingled with the atmosphere, although they could not be completely understood, either in their nature or operation, nevertheless, engaged the attention of this faithful disciple and observer of nature's proceedings.

XVIII. The several mutations of the weather, as depending on the temperature of the different revolving seasons, were carefully remarked by the Roman physician. Its pureness or defilement were hitherto not so immediately and essentially interesting to seafaring people; for, strictly speaking, their confinement on shipboard had not yet been very prolonged. At land, however, after mankind were congregated in assemblages, or encamped in multitudes, the clearness and goodness of the air would be a consideration of remarkable importance. And here it may be suggested, that in all ages, the history of mankind has frequently demonstrated the mischievous consequences of undue crowding, without the necessary attention to ventilation and cleanliness. A lengthened description of all the inseparable properties or adscititious circumstances of the atmosphere, is not here intended, but more particularly of those qualities which immediately appertain to this department. Hales, Bacon, Galileo, Torricelli, Newton, &c., were amongst the first and most eminent, who attempted to ascertain something of the mechanical properties of the atmosphere. Its denseness, its elasticity, capability of dilatation, or rarefaction, and aggregation or condensation, were some of the circumstances of their experiments.

XIX. The examination of the composition of the atmosphere was undertaken in the days of Boyle; but the principal advancement in this pursuit was effectuated by Cavendish, Priestley, Scheele, Lavoisier, &c. The latter chemist laboured diligently and usefully in this chemical research; and to his commendable perseverance and successful investigation, this science is largely indebted for its improved condition. The most important discoveries have been obtained towards the termination of the eighteenth century. After a multiplicity of experimental investigations, instituted and performed by enterprizing philosophers at different times and places, the elementary substances constituting the most remarkable in the atmosphere, are found to be these subsequent; first, that denominated oxygene, from the supposition of its being the cause of acidity, or sourness; the second azote, so called by the Gallican chemists, on account of its deleterious influence upon animals. A third substance, which was discovered by Dr. Black, carbonate of oxygene in a state of liquidity, or what is usually called carbonic acid. And fourthly, heterogeneous and numberless bodies continually evaporating, or passing from the earth's surface, and going into the atmosphere. The vaporation from vegetable and animal materials, and whether these bodies be in a state of vegetative liveliness and animation, or lifeless, and therefore naturally and necessarily susceptible of the putrefactive decomposition; and manifold other exhalations which, on account of the imperfection of knowledge, cannot at present be investigated nor comprehended. The azote might be styled thanatode, as more particularly applicable, being expressive of its noisome and destructive power upon life; whereas the authorized name literally and naturally implies an intransitive qualification, and may be indicative of any substance destitute of the principle of animation. The separation of this air from oxygene, by the apposition of any body which might have an affinity or attraction for it, appears at present impracticable.

XX. The atmosphere, however, can be decomposed by substances possessing an affinity for oxygene, and in this manner the azote is indirectly obtainable. Dr. Priestley was the first who ascertained oxygene as a separable and distinctive substance, and possessing peculiar properties. He considered it, agreeably to the prevailing notion, as air unconnected with phlogiston, or what was deemed the principle of inflammation; whereas, azote was considered to be in conjunction with the phlogistic principle. The ingenious and laborious Scheele made experiments with some of the sulphurets, phosphurets, &c., which have the faculty of joining with the oxygene, which last being incorporated with them, the former volume of air thus undergoes a proportional diminution. The remainder, which is principally thanatode, becomes incapable of supporting combustion, and answering the purposes of respiration. And thus these two celebrated philosophers first ascertained, that the atmosphere is especially composed of these two essentially necessary constituents. Lavoisier was the first, however, who approached nearest to exactness in determining the respective proportions of these bodies, as subsisting in the composition of the atmosphere.

XXI. Atmospheric composition being thus chiefly effected by the concurrence of these two airs, a consideration of importance was the ascertainment of their individually contributing proportions; and also whether these existed in an invariably determinate measurement, or contrariwise, were sometimes in this respect changeable. As lately said, the atmosphere could only be decomposed by the separation of the oxygene from the azote, by means of matters having an affinity for the former of these substances. Different substances were used for this purpose, and from the readiness of combination of the oxygene with some of these, the instrument called Eudiometer has been constructed. Eudiometrical experiments have been differently performed, according to the inclination, &c. of philosophical investigators. The first contrivance of this description was that by Dr. Priestley. In the progress of his experiments, he observed, that if nitrous gas were added to common air over water, then its cubical measure was speedily diminished; and that this diminution was proportionate to the quantity of oxygene which had disappeared. A variety of articles, which an acquaintance with chemistry will promptly suggest, may be used, for determining the purity of the atmosphere, or rather the quantity of oxygene which may be therein contained. Nitrous gas, the liquid sulphurets, hydrogene by the assistance of electricity, but this last mode is inconvenient and not so commonly applicable. Another method, is the spontaneous combustion and decomposition of phosphorus. In operating with this substance, it is necessary to remember, that the remaining portion of air suffers some dilatation. Berthollet has ascertained this expansion to amount to about a fortieth part of the air employed. This last mode of determining the air's pureness is, for common purposes, more manageable than most of the preceding.

XXII. The essentially requisite constituents of the atmosphere, as determinable by the most unsuspected experiments, are apparently in all parts of the earth, the subsequent; 21 to 22 of oxygene, and 78 to 79 of nitrogene. These proportions are calculated in relation to their specific gravities, and consequently their respective cubical measures must be materially different. The intermediate calculation of the specific gravity of oxygene, as deducible from the experiments of several of the most ingenious and best informed chemists, is about 1.110, while that of azote is only about 0.974. Conformable to equivalent principles, a hundred cubical inches of oxygene will weigh about 34 grains, and a similar measure of azote about 30, Troy weight, fractional proportions disregarded. These constituent proportions of the atmosphere are subsisting universally in its composition, even at the most lofty accessible parts of the terrestrial surface, and even in different countries and seasons. These would appear to be the suitable proportions in which they are ordinarily subsisting, and in which they are so admirably calculated, both for the support of vegetation, the performance of respiration, and also for all the beneficial purposes, which are continually accomplished by the interposition of the atmosphere. Disjoined or in a separate state, none of them is suitable for respiration; the azote or nitrogene, may be said to be irrespirable, and the oxygene, when uncombined, is not conveniently and permanently fit for this purpose.

XXIII. The presence of a certain quantity of the oxygene in the atmosphere, seems absolutely requisite for the comfort, health, and support of mankind. A considerable diminution of either, but more particularly of the oxygenous principle, is productive of more or less inconvenience or disadvantage. And if the subduction of this vivifying principle be extensive, the effects may be injurious or even destructive. Diversified conceptions have been entertained by different chemists, regarding the mode of conjunction of these substances. Some consider them as united upon mechanical principles; others view them as combined by chemical efficiency; others, again, as reciprocally holding themselves in a state of dissolution. The arguments most favourable to the last supposition, is the continuance of their cubical measure, and a relative state of specific gravity. Oxygene and azote, therefore, are the fundamental and physically characteristic substances in the composition and constitution of the air; or, as it is frequently and collectively denominated, the atmosphere. Carbonic acid, or carbonate of oxygene, is another article which constantly enters as a diminutive part of the atmosphere. This substance was discovered by the ingenious Dr. Black. Cavendish and Priestley afterwards examined its properties, and its composition was ascertained by Lavoisier. Professor Black's examination of magnesia, and some other alkaline bodies, led to the discovery of this air, which he named fixed, because it entered into the composition of many substances, the alkalies for example, which were the subjects of his experiments, was consolidated and thus disappeared. He likeways determined it to be always present in the atmosphere; and concluding, from the result of different experiments and observations, performed at considerable altitudes above the earth's surface, it appears to be generally dispersed through the atmosphere. The quantity is changeable, as this circumstance is determinable by a multitude of occurrences, but ordinarily not surpassing a 1000th part of the whole atmosphere.

XXIV. The respiration of animals, the combustion of different substances, are continually throwing it into the common air. The consequences of this, however, are perhaps counteracted by its decomposition, and subsequent appropriation and condensation in the vegetable kingdom. This is one beautiful illustration of the reciprocal communication and subserviency of the different substances, primordially and substantially employed by nature, in the numberless arrangements, decompositions, and organizations, &c. so wonderfully and beneficially carried on in every part of the universe. The purpose which this small portion of carbonic acid, which is always present in the atmosphere, may fulfil, is difficultly defineable, and must be the subject of consequent observation. Its presence is instantly ascertained by lime water. The alkalies (strictly so called), and some metallic oxydes, readily unite with this substance. The immediate regulation of the quantity of this oxygenous carbonate in the atmosphere, as of many other things connected with this subject, although providently instituted to answer some useful intention, is seemingly, in the present state of human knowledge, absolutely inexplicable.

XXV. A remarkable circumstance, immediately applicable to an investigation of the atmosphere, is, that it always contains more or less of aqueous vapour. This circumstance must have been observed and regarded in all ages and countries. Moisture, "aquarum quasi vapor quidum aër habendus est," is continually exhaling into the air, from every part of the terraqueous superfice. The exhalation in the state of vapour, and its deposition afterwards in dew and rain, have been manifested to mankind ever since the beginning of physical occurrences. The air generally contains some water; even after a considerable continuance of dryness, as it is commonly understood, it is never absolutely destitute of some aqueous principle. This humidity of the air is discoverable by many substances, whose operations are regulated either by mechanical or chemical principles. Substances which have the power of abstracting moisture from the atmosphere, without, at same time, indicating its proportion or existing quantity, have been denominated hygroscopic. Those articles again which demonstrate, by their augmentation in magnitude or heaviness, the quantity of aqueous vapour which may be subsisting in their immediate neighbourhood, and, on this account, the conclusion of their declaring the whole quantity of moisture, have been called hygrometers. No contrivance, of this description, can demonstrate the absolute quantity of aqueous vapour, which may be contained in the atmosphere. It is only a comparative estimate of the commonly observeable and correlative states of what are ordinarily styled moistness and dryness; for the atmosphere can hardly, by any known process, be completely deprived of moisture. The commencement of its dampness is not discoverable; and, therefore, the intermediate line of demarcation of these two opposite conditions of the atmosphere, is not determinable.

XXVI. Evaporation, which is the natural and constant cause of atmospheric dampness, is modifiable by an almost innumerable assemblage of circumstances. The condition of the exhaling surface, the quantity of moisture which the air may previously contain, by which its capacity for receiving an additional quantity is relatively influenced and diminished. The degree of temperature, also, must be taken into calculation; and what is of considerable importance, the stillness or commotion of the atmosphere. Augmentation of temperature—other things favourable—is always conducive to evaporation; and, contrariwise, its diminution, unfavourable. Evaporation from the terrestrial surface is generally accelerated by aerial agitation; this last circumstance, with the suitable concomitance of calorific influence, are most contributive to the speediness of its performance. The quantity of vapour sometimes contained in the atmosphere, must be very extensive. Water heated to 212° of Fahrenheit's thermometer, when it is converted into steam, possesses an elastic force, equal to that of the circumambient atmosphere, and is capable of balancing a tubefull of mercury, equal to thirty inches in altitude. And when descending below this temperature, its elasticity undergoes a progressive and correspondent diminution; or, in other words, the elasticity of aqueous vapour below the boiling point, is proportionally consentaneous to the declination or augmentation of temperature. Evaporation, therefore, is continually but differently going on, in all the ordinary degrees of atmospheric temperature.

XXVII. As water subsists in the common air, it is said to be in the condition of vapour; and in this state, it is constantly present in all observeable temperatures of the atmosphere. Exhalation is always proceeding, in winter, in summer, in every climate, in every country; but it is regulated somewhat in its quantity, &c., by the extent of watery surface naturally exposed, and the other circumstances aforementioned. And this consideration, therefore, is one reason of the remarkable inequality of different countries, in dew, rain, their comparative dampness and dryness, &c. This variableness of this circumstance, moreover, must wonderfully influence both the vegetable and animal productions of respective territories, and, what is of commanding importance, the healthiness or unsoundness of their inhabitants.

XXVIII. Different opinions have been entertained concerning the state of vapour, as existing in the atmosphere; but as it is unnecessary to investigate the multifarious hypothetical conclusions upon this subject, so they shall not be here particularly introduced. The denseness and volume, and consequently the heaviness and cubical measure of the atmosphere, will, in a certain degree, be conformable to the absolute quantity of watery vapour it may at any given time contain. And superadded to the substances already mentioned, which it comprehends, it is also the magnificent amphitheatre, in which electrical phænomena are so dreadfully and sublimely represented. This wonderful and subtilely powerful influence is always contained in the atmosphere. A reasonable supposition from circumstances, would lead to the conclusion, that this subtile matter is generated more especially over the earth's surface. In tropical climates it is particularly observeable, over continents and islands, or at least not far from their neighbourhood. And when observed to be largely prevalent at sea, islands, &c.

may commonly be expected at no very great distance. This is not proposed with the unshaken confidence of absolute certainty, but as a physical occurrence highly deserving more determinate examination; and is, at all times, to seafaring people, a consideration of importance. Electricity appears to be requisite in the constitution and maintenance both of the vegetable and animal kingdoms; or what is more, perhaps, of the universe. Conformably to its changeable quantity in the atmosphere, some people are wonderfully, but inexplicably affected in their constitution.

XXIX. Dr. Franklin first ascertained, and demonstrated, that thunder is dependant on electrical influence and operation. It is one of the most mobile, and extensively diffusible, and powerfully operative matters in the universe. What relation it has to caloric, is at present unknown; but judging from their respective phænomena, and some of their particular properties, a very intimate connexion is probably subsisting betwixt these two substances —Electric particles are mutually repulsive, in proportion to their absolute distance. They also possess an attraction for the particles of other substances, with a power decreasing according to the distance. They intermingle with, or are propagated through, different bodies, with variable degrees of facility. Substances through which they move, with seemingly instantaneous swiftness, are denominated non-electrics; and bodies in which they meet with perceivable obstruction, or in which the electric matter accumulates, &c., are styled electrics. The air is an electrical medium, and different volumes of it may be unequally electrified; the one positively, the other negatively. This, however, is a state of short continuance, and which is constantly succeeded by that of æquilibrium, or equable diffusion of the electrical influence. And this equable diffusion is accomplished by what is called an imperfect conductor. Clouds, therefore, constitute part of the machinery employed for this purpose. These, however, to constitute them effectual, *intermedia,* must contain water in the state of vapour, and this again in the state of commencing condensation. It seems probable, that during the equable dispersion of the electric matter, that water is decomposed; but the nature, extent, &c., of the supposed alterations, are altogether unknown.

XXX. Some other aerial matters may occasionally be dissipated into the atmosphere; but an endeavour to describe, or even to enumerate them, would be both unprofitable and impossible. Hydrogene may, in some places, be diffused in it, or more generally, but sparingly propagated, and most probably in trifling quantity; but its presence is by some considered doubtful. Several of its compounds may, likeways, be generated and dispersed through the air, in particular occasions and situations. Numberless substances are continually evaporating from the earth's surface into the atmosphere; but which, afterwards, are often not discoverable, neither can they be subjected to chemical examination. These exhalations are transmitted from every part of the terrestrial superficies, and from every substance which is susceptible of vaporation, or any body which is capable of discharging any separable and exhalable substance. All vegetable and animal bodies, whether dead or alive, are dispersing their particular and respective exhalations into this boundless expanse of air, the atmosphere. The otherways occasionally injurious consequences of all these, must be contravened by some beneficial operations, which, in the present state of human knowledge, cannot be apprehended, and which are far less, in their circumstances, determinable. Poisonous miasmata are supposed frequently to be circulating, or floating, in the atmosphere. The miasmata morborum are seldom propagated and extensively disseminated, unless by the most inexcuseable carelessness or mismanagement. The unnatural closeness, and unseasonable confinement, of people ailing with transferable complaints, may thus engender miasmata, sufficiently powerful in producing distempers, and afterwards displaying in others a similitude of character. This has been a misfortune of too frequent occurrence: but a few hints upon this important subject will be introduced in the concluding department of this untaking.

XXXI. The insufficiency and imperfection of instrumental apparatus, unavoidably precluded the ancients from the possibility of a knowledge of the weight of the atmosphere. The discovery of the barometer, in the seventeenth century, contributed to the fulfilment of this investigation. The amount of the compressure of the atmosphere upon the earth's surface, almost surpasses credibility. The barometer, then, hath materially assisted mechanical philosophers in determining the changeable state of ascertainable atmospheric heaviness. Philosophers have condescended upon some point, when its gravity, in ordinary circumstances, is about a maximum. Atmospheric temperature at 60°, and the barometer itself standing at the altitude of 30 inches, will give the common point of highest elevation, and consequently of the air's condensation. Some occasional exceptions to this do intervene; but not so as to invalidate the generally applicable proposition. By ascertaining the weight of the column of quicksilver, and the extent of its base, the weight of a column of air, (extending to its remotest surface,) equivalent to that of the metallic, is thus obtained. A knowledge of the extensiveness of the earth's superfice, will, by multiplication with the altitude of the quicksilver, give the weight of the whole surrounding atmosphere. This measurement of the weight of the atmosphere, comprehends, undoubtedly, all its heterogeneous impregnations; and how much these may affect its absolute weight, remains indeterminable. The pressure of the circumambient atmosphere must answer many important purposes. All the operations proceeding on the earth are, in some measure, modified by its powerful influence. Animals depend upon it for respiration and other diversified assistances, and vegetables are indebted to it for their continued existence and increase. Remove the atmosphere, (and consequently its regulating compression,) and probably the mundane structure would tumble into confusion. But here allowance must be made for the power of gravitation. The external and continual pressure must operate strongly upon all animals, and be conducive to their firmness and beneficial compactness. In proportion to the equability of its pressure, they are frequently in possession of healthful soundness and durability. These observations upon this interesting subject, might be considerably lengthened; but different considerations are interdictory to enlargement.

XXXII. Atmospheric compression operates upon all bodies within its grasp; and when calculation is made of its absolute force borne by individuals, it may appear surprising, and even, at first sight, exceeding credibility. A person of ordinary magnitude supports a pressure, equivalent to the weight of fourteen tons, or two hundred and eighty hundred weight. If this superficial compressure were not circumambient and equipollent upon every tangible point of the corporeal surface, and also be internally counterpoised, it would undoubtedly be intolerable, or rather immediately destructive. In the different alternations of the comparative lightness or heaviness of the atmosphere, the proportional incumbency upon individuals must, necessarily, be liable to considerable inequality. This proposition may be conveniently exemplified. Suppose the barometer standing at 30°, and the simultaneous compression of the atmosphere equal to 280 cwt. upon an individual of moderate magnitude: but by rarefaction of the air, there is a declination of the instrument to 29°, 28°, or perchance to 27° (but which last is seldom observeable); there will consequently be a proportionate diminution of the pressure upon the person's superfice. At a subsidence of the instrument to 29°, the corresponding reduction will be to $270\frac{20}{30}$ cwt., or 13 tons 10 cwt.; and if it is lessened to 28°, the pressure will fall to $261\frac{10}{30}$ cwt., or rather more than 13 tons; and, lastly, if the subduction reaches 27°, the correlate decrement of pressure will be to 252 cwt., or 12 tons 12 cwt., upon the corporeal surface. The disparity between these two possible extremes, then, will seem to be of some importance; amounting to no less than 1 ton, 8 cwt. upon an individual. These circumstances would apparently be of considerable importance, and yet they are almost universally, never intelligibly perceptible.

XXXIII. The intermediate inequalities must almost be innumerable and incalculable; from the subtraction of a few grains, to the seemingly incredible and important reducement of one ton and eight-twentieths. In considerations upon the atmosphere, as physically and essentially connected with the existence, health, comfort, &c. of mankind, the influence of its mechanical pressure has just been slightly examined. Although these differences, as operating upon corporeal structure, appear prodigious, and, at first sight, might be deemed insupportable, nevertheless, in the variable latitudes especially, they are almost continually happening, without being particularly observeable, by their influence on the constitution; and thus not appretiable, but by instrumental demonstration; nor are they, for the most part, perceptibly detrimental. These circumstances, however, although they may not perpetually be declarative in their immediate operations, do occasionally superinduce unpleasant consequences. Upon diminution of the air's compressure, but more particularly when this is considerable, and such change previously not much experienced, the superficial circulation becomes more abundant; and if the pulmonary contexture is imperfect, hæmoptysis, &c. are sometimes unhappily introduced.

XXXV. In the same parallels of latitude, the ba rometer is generally highest, the more the situation approaches the level of the sea, which is naturally the lowest point, when accurately compared with the whole terraqueous surface, and consequently supporting the highest column of atmosphere. In the tropical latitudes, too, the difference of the indications of the barometer is not so extensive as in the variable. The barometer has been observed, by navigators, in the tropical climates, to undergo diurnal ascensions and depressions, even without the concurrence of any remarkable change in the sensible properties of the atmosphere. The variations of the barometer at sea, and in the tropical latitudes, seldom fluctuate beyond a range expressed by $\frac{80}{100}$ths of an inch, or $\frac{240}{300}$ths of atmospheric fluctuation, or variableness, as determinable by barometrical admeasurement. Some exceptions to these commonly applicable conclusions, have been observeable, as before hurricanes; previously to the commencement of which, the quicksilver has undergone more considerable and remarkable depressions. In the latitudes progressively approaching the poles, it is subjected to more considerable variations, and its elevations and depressions are frequently in a state of changeable commutation. Upon mountains, there is always a depression of the quicksilver; and this commonly corresponds to the particular altitude. The barometer is, therefore, sometimes employed for ascertaining the loftiness of mountains; and this may be accomplished, by a comparison of a determinate fractional part of altitude, with the concomitant depression of the quicksilver, and its absolute declension at the point of ultimate observation. It has also been demonstrated, on mechanical principles, that the heaviness of the atmosphere continually diminishes, in proportion to its elevation from the earth's surface. These circumstances naturally suggest to the reflecting mind, that there must be a point, or term of altitude, where all instruments employable on mechanical principles, will become unserviceable. The barometer, in these circumstances, would be indicative of no particular property, and the very principles of its constitution and application be completely overthrown. The thermometer, likeways, from extraordinary diminution of temperature, (but does caloric operate beyond the boundaries of the atmosphere?) would be an unavailing instrument. In endeavours and calculations for prophylactic administration, the consideration of the equableness or variableness of atmospheric compression, must oftentimes be serviceable.

XXXV. And this will be more peculiarly applicable to those who are unfortunately vexed with pulmonary complaints; but the investigation of these matters do not consistently appertain to this department. Clouds, too, are generated and suspended in the atmosphere; but their formation, physical relations, figurations, colorations, variations and purposes, &c., are at present imperfectly understood, and an examination of all their phænomena would lead into perplexing and troublesome disquisition. They occupy regions of the air, different in altitude, according to their figure, congeries, and specifical heaviness. Many of them seem to be chiefly composed of vesicular vapour, and, by a reduction of temperature, they undergo a proportional condensation and approximation of their particles; and dew, rain, &c. are thus naturally produced. Their colourings must be dependant upon the variegated incidence of rays of light; and hence the inimitably beautiful appearance of the clouds, so frequently remarkable in the mornings and evenings, but especially in tropical climates. As formerly mentioned, they also are often the intermedia of the wonderful and sublime phænomena engendered by electrical efficiency. They, frequently, opportunely and acceptably overshadow the earth, and thus become serviceable and beneficial to the weather-beaten traveller. Their particular, and often expressive and characteristic appearances, moreover, prognosticate important revolutions of the weather, ere their immediate occurrence; and thus beneficially suggest admonitions for preparation. On these accounts, they constitute objects of frequent and interesting attention and observation, amongst the seafaring part of mankind, and agriculturists.

XXXVI. These abbreviated observations being introduced, the temperature of the atmosphere now becomes a circumstance of eminent importance, and, from the nature of the subject, deserving of considerate investigation. The temperature of the air is changeable in every latitude; but in the tropical, this vicissitude is, at sea, never so remarkable. It appears necessary, for the illustration of the subject, to institute an inquiry into the probable cause of this communicated property of the atmosphere. The existing warmth of the common air is altogether a borrowed and adventitious qualification, and without this adjunctive agent, neither the vegetable nor the animal kingdoms, conformably to their present constitutions, could be supported and maintained. And perhaps without the principle, caloric, or matter of heat, the atmosphere could not subsist, in its present condition. The matter of heat is, next to electricity, the most subtile and powerfully operative principle in nature. From its inconceivable subtileness and diffusibility, it, most probably, in a modified degree, pervades all materially constituted substances. It will not appear strange, therefore, concerning the notions of the ancients, as entertained about this supposed Elementary Substance. They considered it to be a principle universally disseminated; and deemed a physically operative, but at same time immaterial agent, whose influences were expressed, or understood, under a great number of mysterious or enigmatical appellations.

XXXVII. Caloric, the modern name for the matter of heat, whatever this may be—whether a property of other bodies, or a separate and particular substance; and which latter is the most probable conclusion—is a subtile fluid, and, as just said, essentially necessary to the existence of both the vegetable and animal kingdoms. The sun, that glorious heavenly luminary! has declared himself to mankind, in all ages, as the original and fountain of this invisible, but powerful and penetrating substance. This dispreading influence was supposed, by some of the ancients, to proceed from the sun's combustion; and hence the phænomena of light and heat were explicable. The nature of caloric is not correctly ascertained; and indeed, like many other subjects of extreme subtilty and mobility, must re main eternally concealed, excepting in some of its more ordinary effects or operations. Caloric, fire, or heat, has been generally considered as an elementary substance, and this was certainly the opinion of the ancients. Some of the moderns, however, have thought it to be merely an attendant property, not a particular and determinate substance. A reasonable conclusion is deducible from all the observations and experiments of different philosophers, and especially of Dr. Herschell, that it is a peculiar and distinct substance, in possession of attributes naturally and peculiarly characteristic. It has been likeways ascertained to be conformable to the same laws as the rays of light, in refraction, inflection, reflection, and its other movements. A remarkable and very important property of caloric, is its capability of irradiation, which, as employed nowadays, must be translated *reflection*: and made expressive of the substantial calorific influence—as reflected from surfaces—at an angle precisely equal to that of incidence. This reflection of the heating energy has been determined, almost conclusively, to be most effectually performed through the medium of the atmosphere, or other aerial and elastic bodies. The irradiation of caloric is liable to considerable modification, according to the reflecting surface. It is, moreover, liable to impediment, or it is conditionally intercepted by the interposition of solid substances. The examination of this subject would be entertaining and instructive; but, with allowance for some shortened remarks, must here be deemed irrelevant.

XXXVIII. As caloric is the efficient cause of temperature, in all its modifications and comparative fluctuations, a more particular investigation, however, might be commendable. For the elucidation of some of the subsequent considerations upon atmospheric temperature, it may be adviseable to subjoin some observations upon the more ordinary properties of caloric. One of these characteristic qualifications, is its unintermitting disposition to an equability of distribution. The explanation of this circumstance has been differently attempted by particular philosophers. A few of the more conspicuous occurrences have been described; but, in a matter of such nicety, the greatest number of opinions may be deemed presumptive and hypothetical. The constant disposition of this potent agent to an evenness of diffusion, must be observeable by the most inconsiderate. This propensity to uniformity of distribution is continual, but from a regulating ordination of physical concomitants, is never thoroughly and universally accomplished. If this took place, there would be an equability or sameness, every where obtaining perceptible subsistence; all distinction of seasons, of climates, and the occasionally agreeable alternations of coolness and warmness, would be blended in the irksomeness of an unchangeable temperature. In the propagation of heat, its acceleration, or retardation, is greatly influenced by the constitution and disposition of surrounding substances. Upon the augmentation or diminution of the temperature, the rarefaction and condensation of the atmosphere is immediately depending; and in this manner, also, the quantity of caloric it may contain in a state of diffusion, modifies its comparative heaviness or lightness. The transmitting, or—as it is more commonly called—the conducting power (or rather faculty) of bodies, is regulated, very remarkably, by the nature of the medium or substance through which it is to be propagated; and this property, or quality, would be uniform, if the temperature and medium were invariable in their circumstances. The readiness or speediness of the distribution suffers a retardation proportionate to the approach of the body receiving caloric to the temperature of surrounding substances. Liquids, it may be observed, possess a greater facility in abstracting caloric than aerial substances, but the conversion of the former into the condition of vapour, is perhaps the most prompt and efficient method for engendering coolness, or diminution of temperature. It is not, however, here consistent nor necessary to enter into a discussion of all these circumstances; all that can be reasonably expected, are some short animadversions to lay a foundation for some of the subsequent observations and practically applicable conclusions.

XXXIX. Another and constant effect of heat, is its peculiar influence on the specifical magnitude, or cubical measure of all terrestrial substances; or to use a chemical term, in proportion to their *capacity* for caloric, and its intensity or subduction. The general and ordinary operation of caloric, does not show in all these bodies an equality of effect; its action is liable to modification by a multiplicity of circumstances. Some of the immediate consequences of its operation are an alteration both in the magnitude, constitution, aggregation, and capability of combination, &c. of different substances. By magnitude, is signified the absolute greatness or largeness of any particular substance, exclusive of comparative, but implying specifically applicable measurement. By constitution is understood, the primodial composition, conformation, and consistency of any particular substance. A frequently observeable consequence of an augmentation of temperature, or increment of calorific faculty, is an increase of the cubical volume of the bodies exposed to its expanding influence; and, frequently, an alteration in their ordinary consistence. Solidiform substances may be liquified, and liquids or fluids may be converted into vapour. The most ordinary, and, indeed, the most invariable effect of augmented temperature, is expansion. As far, indeed, as investigation has been instituted, with a very few exceptions, this consequence is perpetually observeable. In different substances, however, this effect of heat has been found to be widely different. The expansion or dilatation of aerial bodies, is commonly, of all fluids, the most extensive. The expansion of common air, for example, is to that of water as 13 to 10, fractions neglected. The difference betwixt these and solids, it may be observed, is much more extensive.

XL. As far as experiment has proceeded, the expansion of the different airs by the progressive augmentation of caloric, have nearly a correlative proportion; and it appears probable, moreover, that this is frequently conformable to geometrical proportion. The expansion of liquids has been determined, not to abide by such an invariable uniformity in their relations. The most volatile of these are the most obedient to the laws of expansion, or undergo this change with the greatest readiness. In different liquids, the same quantity of caloric imparted, produces, in the different substances, a prodigious inequality of expansion. Water at 212° of Fahrenheit's thermometer is converted into steam, which, when in this condition, occupies about 1800 times its former volume. Some liquids are capable of existing in the state of vapour, in all observeable temperatures, while others require a certain quantity of caloric for this purpose. The softness and liquidity of many bodies depend, therefore, upon the presence and operation of caloric. Caloric may be justly considered as a distinctly elementary substance, and most extensively disseminated in the universe. The absolute beginning of its existence or presence, and its termination, or the maximum of its intensity, are equally unknown. The theoretical conceptions about its commencement, or lowest conceiveable degree, are altogether nugatory and untenable. This is a mystery which never can be explored; it will never be scrutable by human judgment; neither is that of its maximum, or greatest practicable concentration, ascertainable.

XLI. The expansion of solids is ordinarily, individually, and comparatively, very inconsiderable. Those, however, which are convertible into vapour, as soon as that change of their natural condition is induced, are exceptions to the foregoing extensively applicable proposition. These substances, when in the state of vapour, are susceptible of a great increase of volume or expansion. All these are capable of existing in the mass of air, as long as the quantity of caloric, necessary for supporting them in the condition of vapour, is not withdrawn. They, accordingly, when in this state, have sufficient elasticity to counteract that of the atmosphere. This repulsive property of different vapours, is increased by an enlargement of temperature. Although the ancients admitted the existence of only four elementary substances, fire, air, water and earth; it is, however, allowable to conclude, that they impliedly understood another acting power, namely, cold; which, in those days, was considered as a separate and materially operating *something*. And to this substance they attributed peculiarly distinctive properties, by which it produced all the wonderful and important consequences assignable to its operation.

> "Acrior aut Boreæ penetrabile *frigus* adurat."
> "Si non tanta quies iret, *frigusque* caloremque
> Inter."
> "*Frigora* nec tantum canâ concreta pruinâ,
> Aut gravis incumbens scopulis arentibus æstas."

Cold was considered as manifesting properties completely opposite, or repugnant to those of heat, and that they were incongruous and inconsistent with each other, "nam frigida pugnabant calidis" was the poetical conclusion, and indeed their philosophic determination.

XLII. The augmentation of temperature communicates the notion of heat, when acting on sensible animate structure beyond a certain degree; and oppositely, its declination produces the conception of coldness. The comparative intenseness of the impression, arises from the swiftness or slowness, and simultaneous greatness, or gentleness of the temperature. The perception will, *cæteris paribus*, be proportionable to the difference of the temperature of the body communicating, and of that liable to the communication. When philosophers began to contemplate the nature of cold, they, owing to their imperfection of the knowledge of the properties &c. of heat, found it necessary, for the explanation of some of their hypotheses, to consider it as a particular individual substance. The frigorific principle was deemed to be constituted of extremely attenuated particles, of a saline quality; and from the minuteness and acuteness of their figuration, capable of penetrating all other substances. They were supposed to be continually floating in the atmosphere, and, from their conceived peculiarity, were denominated, "frigorific particles." This opinion was entertained by different philosophers, as late as the 18th century, and amongst the uninformed is even now an article of undoubted credibility. This hypothesis, however, among the more intelligent, is given up, and cold is now considered to be, according to its variable and different intensities, the consequence, or rather accompanying effect of the correspondent changeableness of the agency of caloric, which, as already mentioned, is the cause of atmospheric temperature. "Heat signifies a sensation, and cold a contrary one. But heat, likewise, signifies a quality, or state of bodies which hath no contrary, but different degrees." The diminution, or augmentation of temperature, is continually attended by its correlative; and the first state is cold, according to the determination of uninstructed apprehension. What has been customarily denominated cold, therefore, is nothing but an imaginary state produced by the privative condition of caloric. At the conceiveable commencement of caloric, this negative condition must be in possession of its greatest evidence; and this condition may be styled absolute cold, relatively; and, thenceforth, all its possible gradations, to its apparent abolition by concentrated calorific efficiency, will be perceptible. The comparative extensiveness of these seemingly opposite properties, with their remarkable variableness, are circumstances which are perpetually and irresistibly experienced. They are particularly exemplified in all the variable latitudes. The predominaing state of atmospheric temperature, (a subject of great moment,) its intenseness or remissness, vicissitudes, &c. constituting considerations of importance in the maintenance of health, or production of disease, certainly demand attentive examination.

XLIII. It appears a probable conclusion, that if all the caloric were abstracted from the atmosphere, it might assume a solid form ; or, perhaps, undergo some other unforeseen transmutation, and, consequently, new arrangement of its constituent principles. Heat or caloric is absolutely necessary for supporting the liquidity, elasticity, and other properties of the atmosphere. A circumstance deserving to be mentioned before leaving this part of the subject, is the unexpected occurrence of the direct rays of caloric, having no power in warming the atmosphere. The rays of heat, emanating from the sun, however concentrated, produce no immediate or apparent operation upon the atmosphere ; but when they are reflected, or irradiated from the earth's surface, produce their customary influence. This effect will, moreover, be materially regulated by the peculiar properties of the surface upon which the descending rays may have been primarily incidental. And, on this account, the simultaneous and very perceptible difference of temperature, which is so frequently remarkable in the same parallelism of latitude, is determinable by its superficial qualifications, as lowness or loftiness, irregularity or smoothness, and unentangled exposure, dampness or dryness, &c. By experiments, it has been ascertained, that elastic and aerial media, are the most favourable to irradiation. It has not hitherto been determined, whether aqueous liquids be conducive to calorific irradiation. It however appears a probable supposition, that an operation of this nature must be constantly proceeding at the aqueous surface, otherways an explanation of the approach to equability of temperature is impossible. And, if caloric is reflected, or, perhaps, rather carried, from watery surfaces, why are they not brought to an æquilibrium with the temperature of the atmosphere? The investigation of this subject, being both entertaining and interesting, it is hoped will engage the attention of some enlightened philosopher.

XLIV. An observation was lately made, that expansion is one of the most common effects of caloric upon almost all substances, or with a very few exceptions: and water constitutes one of these unfrequent anomalies. The precise maximum of densation of this fluid has not been completely ascertained, from the difficulty of observation, being a subject not accurately or invariably manageable. But the most probable conclusion is, that water is densest at some point from 36° to 40 of Fahrenheit's thermometer. The estimate is somewhat different; about 40°, however, would appear, from the best information, to be the indication of its greatest condensation or aggregation, and consequent specifical heaviness. When it is heated above, or cooled below this point of highest probable density, its specific gravity is then, in the slightest degree, lessened; and, therefore, the water which was before exposed at the surface, changes its situation. For example, if water previously at 32°, or the indication of the freezing standard, should be accidentally heated to 36°, or from this to 40°, its denseness or closeness of particles, and consequently its specific gravity, will be increased; and, therefore, it will assume a descending disposition, and the colder and lighter water will take its place at the surface. And if the atmospheric temperature is higher than that of aqueous surface now exposed to it, the water may absorb an additional proportion of caloric, and as soon as it has gained the maximum of density, it will then be capacitated for descending, and thus the operation may be continued until it approaches an æquilibrium.

XLV. This appears to be one cause of the approaching uniformity of the temperature of extensive aqueous collections. This circumstance will likeways explain the reason why (as long as the water remains at the maximum of density,) the warmer water generally maintains its place or station at the surface. But, if the water at the bottom were to attain its maximum of densation, or 40°, it might thus continue till the whole had reached near this degree, and then the operation would be reversed, when the coldest water would assume its situation at the surface. It would thus appear, that caloric is continually employed in supporting or maintaining the temperature of water, and in this manner a considerable quantity of it must be expended. From the operation of caloric upon those collections of water, which may seemingly be motionless, there must be a commeatus of the different parts, although the interchange may not be perceptible. The subject, it may be remarked, requires additional examination, before its nature and amount, and influence, among physical operations, can be ascertained. From all intelligible considerations, it seems inferible, that there is a perpetual communication of temperature betwixt aqueous surfaces and the atmosphere; and whichever of these may happen to be lowest, will therefore receive heat from the other, until they approximate a state of uniformity. In this way, in the colder seasons, caloric may be constantly passing from watery surfaces into the atmosphere; and hence, apparently, the maintenance of a greater evenness of temperature, or at least a comparative contractedness of atmospherical variableness.

XLVI. The earth's surface, and especially in tropical latitudes, is commonly warmer than the superincumbent atmosphere. This is particularly observeable in those substances which are imperfect conductors of caloric, or in which it is progressively accumulated; but after some time, many of these reflect heat powerfully. Sandy grounds, and stones, and all sabulous or arenaceous and parched deserts, are, in those countries which may be exposed to keen solar influence, notable examples of these circumstances. In all situations in the warmer climates, these bodies become unduly heated, and thus are annoying and distressing to those who may be exposed to their reflected operation. In the tropical climates, even on shipboard, and at great distances from land, solid bodies absorb so much caloric, that there may be a difference of 36° or more in the same vessel; and from this statement, some conception is deducible of the important, and frequently harmful influence, to which, in the discharge of his necessary services, the unlucky seaman may be exposed. This may appear, to those who have never adventured themselves to all the inconveniencies and hardships of these peregrinations, of no particular importance; but a dissimilar conclusion must be drawn by those who have undergone the burdensome annoyance of these circumstances.

XLVII. Why irradiation should be gradually diminished, in proportion to the altitude of the atmosphere, or the elevation of any particular place, has not been sufficiently investigated, to admit any plausible explanation of the occurrence. The reality of the fact, however, has been irrefutably established. It has been ascertained, by ascending lofty mountains, and also by the frightful and dangerous enterprise of those who have committed themselves to the aerial regions, supported by the uncertain structure of a precarious balloon. The formation of snow, hail, and their subsequent descent upon mountains, while the lower districts are exempted from such accidents, appear to strengthen, or rather doubtlessly confirm, this conclusion. The moderns have thus completely subverted the determinations of the ancients on this subject. In the region where the latter placed their "æther igneus vel ignifer," the former, in the plenitude of their scientific confidence and knowledge, say they have discovered the existence of glacial regions, and expanses of perpetual congelation; only variable in their altitude, according to the modifications of atmospheric temperature, as determinable by the degree of calorific radiation from the terrestrial superfice. And now, from this circumstance, an admissible and appropriate illustration of the variableness of temperature, which is so continually remarkable in mountainous and other countries, constituted with irregular surfaces, is obtainable. In many islands, even betwixt the tropics, this is conspicuously exemplified. A difference of 400 to 500 feet in height, will be productive of a disparity of 8°, 10°, or even more degrees of temperature. And this inequality will be diminishing or increasing, in proportion to the state of the air on the elevated or depressed surfaces; and the whole will ultimately be regulated by the annually periodical revolutions. Frost and snow are observeable, in different situations, in tropical and other warmer countries. A difference of 15,000 feet of elevation, will produce 50° to 60° of disparity in their respective temperatures. Whether the decrement of heat follows any law of proportion agreeable to the elevation, has not, in all probability, been hitherto determined. There is a likelihood, however, that from the governing influence of innumerable circumstances, that it is irregular. So, then, from more extensive observation, the conclusions of the ancients regarding the tropical latitudes, which they considered not inhabitable from the fierceness of their temperature, are not legitimately maintainable. If a moderate coolness, or even penetrating coldness, be deemed adviseable or suitable in these regions, this reduced temperature is, in many places, obtainable. The notions of the ancients, when poetically ornamented, run in this manner, concerning the celestial expanses and the terrestrial superfice:

> " Quinque tenent cœlum zonæ: quarum una coruscô
> Semper Solê rubens, et torrida semper ab igne;
> Quam circum extremæ dextrâ lævâq; trahuntur,
> Cœruleâ glacie concretæ atque imbribus atris.
> Has inter mediamque, duæ mortalibus ægris
> Munere concessæ Divûm."———

XLVIII. The writings attributed to Hippocrates, and especially in the book *περι τοπων και ‘υδατων*, and in different other passages, contain a description of the *ουϱανου ευϰϱασια,* or the cœli temperies, (cœlum being often employed to denote the common air, aer usqùe ad nubes,) with all its variable properties. This, in vernacular language, is often expressed by the terms, the state, the quality, the condition, the appearance, &c. of the weather. The multifarious consequences supposed to be superinduced by these circumstances, were likewise considered and enumerated. The Grecian physician has also drawn inferences from the warmness or coldness, (or, agreeably to the ancient doctrine, in combination constituting temperature,) and the dryness or wetness, &c. of the atmosphere. These more important and perceptible circumstances were the principal, which, in the state of their knowledge, would conveniently, and more determinately, become the subjects of their observation and examination. The Roman physician has, likeways, introduced some useful remarks on the "anni Tempora et Tempestatum genera." The first appearing to have a more particular reference to the four grand annual Seasons, and the subordinate explementum, "tempestates," comprehending their more immediately respective mutabilities and irregularities. This diligent attention to the variously occurring alternations of temperature, &c. as naturally produced by the succession of seasons, and other physical operations and revolutions, may be used as an applicable and encouraging consideration to perseverance in the investigation of all the circumstances so universally accompanying the changeableness of atmospheric temperature and other appearances. All these animadversions, and their subsequent advantages, and regulations, and applications, as admissible for prophylaxis, or the ad præcavendum, were instituted and appropriated in their employment, with a view to the conservation of healthiness.

XLIX. The temperature of the atmosphere is mutable in all the regions of the earth's surface. This variableness, however, is more especially conspicuous and important in the northern and southern latitudes. In these latter, as is well known, the difference of æstival and hibernal temperature is very considerable; and this mutability is likeways more uncertain in its occurrence, continuance, and greatness. Examples of these extensive alternations are particularly remarkable in such countries as N. America, Russia, Prussia, &c. and are, not unfrequently, considerable, even in Britain, where the thermometer may fluctuate from 12° below the freezing point, or even the beginning of the scale of Fahrenheit's thermometer, up to 80° or 90° in one annual revolution, which declares a disparity betwixt the two extremes, amounting to 90°; but this extensive difference is not commonly observeable. In 1814, the degrees of cold indicated in various parts of Britain were uncommon, and said (the Author was not in this country) to be as low as the beginning of thermometric graduation, or even below this uncommon diminution; but these may be considered as extraordinary occurrences. As a singularity, it may be mentioned, that at Glasgow, in the year 1780, the thermometer was observed at -14°; or 46° below the denotation of congelation. And, in the same year, on the surface of the snow, it was remarked at -23°; or 55° below 32°; or 113° below some of the less frequent or common heats of a British summer; and consequently giving all this extraordinary range of temperature to which the human body may be contingently obnoxious. The latitudes, therefore, extending northwards and southwards, have, in ordinary language, often got the denomination of changeable. And, undoubtedly, if unexpected and unforeseen diminutions and increments of temperature, or depressions and ascensions of the quicksilver in the thermometer, and frequent alterations in the state of the weather, authorize such an appellation, to them it is particularly and unreservedly applicable. In such regions, therefore, these changeable circumstances being very considerable, require more pointedly the attention of all those exposed to their action; and, on this account, the precautions to be used by the inhabitants against their peculiar influence, should be more particular and extensive than those requisite in the tropical territories.

L. Temperature, or temperament, are terms nearly convertible, or commutative appellations. The latter, however, is, in all likelihood, the most classical, and correctly expressive of the modification superinduced by combining two substances possessing physically dissimilar properties or consistencies, &c. The first term is more legitimately assignable to the act of intermingling bodies, having the forementioned constitutional circumstances. As many terms have, in most languages, so this has also undergone a metaphorical transmutation, and been sometimes made significative of intellectual qualification. It may, perhaps, be thus defined,—the consequential proportion or modification of different substances constituting compounds; or bodies containing more than one ingredient; or it is the proportional consequence of constituent ingredients in commixture. As the signification is implicated in the simple and radical word *tempus*, with its lengthened offspring temperare, &c. so the more polysyllabic word temperature (temperatura), must have a reference to the accompanying circumstances at the *time* of their conjunction. That heat, or caloric, constituted the principal cause of temperature, is evident from the general design of the philosophy of the ancients; but upon particular examination, it was more immediately considered as a combination, and that calor and frigus were the two constituents of the compound. The air, of itself, was thought to be very cold and serene; and hence AIΘPA, employed by Homer, and Αιθϱια by others, as especially indicating its sereneness. That the state of the air is modified by the conjunction of heat and cold, seems to be proved by the following quotation: "Ipse vero aër, qui natura est maxumè frigidus, minime est expers caloris. Ille verò et multo quidem calore admixtus est."

LI. Cicero, the approved standard of classical propriety, and elegance and pureness of expression, seems to employ temperamentum in preference to temperatura. Temperies, it may be remarked, was most commonly applied to atmospheric temperature. "Accipe temperiem cœli." *Plin.* "Temperie cœli corpus animusque juvantur, frigore perpetuo Sarmătis ora riget." *Ov.* "Nix tegit alta duas, totidem intra utramque locavit *temperiem*que dedit, *mista cum frigore flamma.*" *Ib.* The denomination temperature was also applied to other substances. "*Temperie* blandarum captus aquarum." *Ib.* "Scatebrisque arentia *temperat* arva." *Virg.* "Potionem suis manibus *temperatam* Philippus medicus Alexandro porrexit." *Val. Max.* "*Temperamentum* cœli." *Just.* "Sequens *temperatura* statuaria." *Vitruv.* "Sol mens mundi et *temperatio.*" *Cic.* The ancients, then, it may be understood, considered calor, heat, or what the moderns have recently styled caloric, as a constituent of temperature; but they had no conception that this subtile emanation was reflected into the lower parts of the air from the terrestrial superfice. They certainly ascribed it to the Sun, as its genuinely productive fountain.

> ——"Medios cùm Sol accenderit æstus,
> Jam rapidus torrens sitientes Sirius Indos
> Ardebat cœlo, et medium Sol igneus orbem
> Hauserat: arebant herbæ, et cava flumina siccis
> Faucibus ad limum radii tepefacta coquebant."

LII. It was the general opinion, therefore, both with poets and philosophers, that heat was derived from the sun, and no other original. The conclusions of Hippocrates upon the nature and qualities of heat, the *το θερμον*, have been previously introduced. His conceptions appear extremely embarrassed and indeterminate; and in one passage seems to substitute Sol, the natural source of heat, for the supreme Jupiter himself. As already mentioned, he has attributed this property to Æther Ignifer; and says, in another place, that the sun and fire have the faculty of abstracting moisture from those substances in which it might be contained: which plainly shows that he instituted a distinction betwixt the sun and fire, or, what was with him the same thing, heat or caloric. Heat, therefore, or its modifications, or fluctuating differences, constituting temperature, would seem to have been, in all ages, objects of peculiar attention with mankind; not only in a medical relation, but as influencing natural productions. It was soon known that the presence and operation of heat were necessary for the production of vegetables, and likeways their maturation and successive unfolding. And it would be observeable, in those situations in which the temperature were moderate and not extensively fluctuating, that those substances depending upon it for their successful evolution, would be most luxuriant and best in their respective properties. It would be further remarked, as population was gradually dispersed either into the sultry or colder regions, that there, either from the intenseness of the heat or cold, the vegetable kingdom would be in some measure influenced, in many of its circumstances. From these and such considerations, it is reasonable to conclude, that those countries which may be denominated temperate, would, generally speaking, be approven and employed before all other territories. But as mankind became more numerous, necessity obliged them to be diffused into those regions which might be previously unoccupied.

LIII. The elevations and depressions of atmospheric temperature, in the countries aforesaid, move through a range terminated by very distant extremes. The quicksilver in the thermometer will, during the greatest warmth of some of the previously nominated countries, be sometimes carried up to 100°, or even 120°, above the mark of the freezing standard. And, contrariwise, if the ordinary instruments could indicate the declination, it will sometimes suffer a retrocession of 30°, or even 40° below the beginning of Fahrenheit's thermometer; and at Hudson's Bay, the spirit was observed in the open air to stand as low as -50°, that is, at the astonishing depression of 82° below the freezing point, and consequently 170° below the solar heat, which has been frequently endured by Britons in foreign climates. This circumstance is a most powerful confirmation of what the human constitution is capable of tolerating and submitting to, with inconceivable accommodation. Those who are exposed in such distressing diminutions of temperature may well exclaim "Who in its cold can live?" The greatest equability of temperature commonly prevails in the tropical climates, and more especially over the watery surface, when uninfluenced by any contiguous continent or land in the neighbourhood. From the equinoctial, to the southernmost and northernmost boundaries, it gradually undergoes a decrement; but this, in its progression, does not seemingly follow any determinate regularity of successive diminution. The temperature is perpetually diversified by the intervention of the continually revolving seasons, and also by the peculiarities of the terrestrial superfice. And, therefore, in all northern and southern latitudes, their highest degrees of warmth happen about the conclusion of their summers, respectively. These seasons, however, are so variegated, that no two of them are precisely similar in all their circumstances. The vernal season being often greatly qualified by the nature of the winter immediately preceding, and the state of the summer by that of the spring, and so in respective succession.

LIV. The middling annual temperature, at the equator, has been estimated at 84° of Fahrenheit's. If observation is made at sea, and at a sufficient distance not to be affected by the warmth of the earth's surface, and the thermometer not unduly influenced by irradiated caloric, this calculation will, in probability, be found somewhat excessive. The equatorial temperature, the forementioned precautions attended to, will commonly move from 80° to 84°; which last, on the main deep, it seldom surpasses. Multiplied opportunities of observation, as crossing the line twenty times in less than ten years; demonstrate it as the most allowable and veritable statement, that the temperature at the equinoctial intermedium, and not acted upon by islands or continents, is ordinarily comprised within 82° of the thermometer. If it rises to 84° or 85°, the instrument will generally be found to have been in an improper exposition, and either influenced by occasional insolation, or the repulsion of heat from surrounding substances. The temperature at the equator is in its most considerable abatement (although the difference is almost immaterial), when the sun is vertical to the tropical latitudes, or the latitudes most contiguous to the tropics, strictly so understood; and when, therefore, the Trade-wind of the counterjacent hemisphere has acquired its most extensive spread and regularity. For example, when the sun is over the tropic of cancer, about the 21st of June, and for some time before and after that period, but perhaps more especially in the months of July, August and September, and when, consequently, the S. E. Trade-wind is then sweeping in its most commanding and diffusive amplitude. In the continuance of these circumstances, the thermometer will be at its most remarkable equatorial subsidence. And by the retroversion of the proposition, an approaching likeness of conclusion will be applicable to the other hemisphere. It should be understood, however, that these observations are made when the atmosphere continues nearly undisturbed by any particularly irregular or tumultuous occurrences. For, here it may be remarked, that the atmospheric temperature is considerably affected by the unsettled and showery weather, which so commonly predominates betwixt the equatorial terminations of these continual breezes, and which thus becomes liable to some irregularity or fluctuation. These winds, in relation to the equator, are either progressive or retrocedent, conformably to the difference and succession of seasons, so that there is an inequality of several degrees of latitude in this peculiarity, of their advancement or retrogression.

LV. Calculations, too, have been instituted to determine the modifications of temperature at the polar regions of the earth, but as there is no possibility of ascertaining this circumstance, so the sophistical conclusions on the subject must, at best, be deemed improbable. A consideration of all the obtainable information, would lead to this as a proposition—and which, from an investigation and comparison of circumstances, seems an allowable supposition—that the septentrional temperature, for three months of the annual circuit, may be conceived to approach to about 45°; and most commonly happening from the middle of June to that of September; and for the remaining nine months, to descend to 15°: this, therefore, would give a mean of 22° 5 for the annual temperature. According to the estimate of the late industrious Kirwan, this was concluded to be 31°; but the critical examination of this matter not being essentially necessary, must, from the nature of this work, be relinquished; and the introduction of the reports of travellers must be deemed unnecessary.—If the attempted exploration of the Septentrional hemisphere, and especially in the polar regions, should be accomplished, it is expected that this part of natural history will not be neglected. But unless the adventurers should happen to be detained in these regions for one hibernal, or rather annual revolution, their intelligence will be the less affirmative and satisfactory.

LVI. Although it has been a vulgar conception, in all ages, that the torrid zone, as it is emphatically denominated, was either not, or scarcely inhabitable on account of its heat, yet it is ascertained, as far as observation has extended, that at particular times of the year, this division of the terrestrial superfice is not exclusively the highest in its temperature. Those tracts of the earth's surface, extending from the 20th to the 26th or 27th of N. latitude, are, in some parts of Asia and Africa, hotter than between the tropical boundaries. This is not a theoretical conclusion, but determined from undeniable experience. This aggravation of temperature is not of uninterrupted continuance, but happens more especially from the end of May (with allowable variations, &c.) till September. In the winter season, even these regions may possess comparative coolness; but what is most important of all, is the occasional difference betwixt the diurnal and nocturnal temperature. In some of the regions included within the forementioned latitudes, during their summer months, the thermometer may rise, even in the shade, to 120°; and stuck in the sand, in the full solar blaze, it may ascend to 140°, 150°, or even 160°: the influence of such warmth upon the human constitution is best known by those who have been exposed in such uncomfortable circumstances. These latitudes comprise the sixth, seventh, and eighth climates, or parallels, of the great geographer Ptolemy; and, agreeable to modern calculation, the mean annual temperature of them will vary from 78° to 73°, according to their relation to the equinoctial. From this it would appear, that their occasional coldness will be still more considerable than the lowest of these degrees specified. These are considerations of remarkable importance to travellers, or residents in these regions, who may not previously have sufficient conception of the evils they have to encounter. It seems to be a general notion of many going to India, that when they proceed northwards beyond the tropic of cancer, they may get into an agreeable degree of coolness; but exposure to the heat of the warmest months is a confirmation of their disappointment.

LVII. A circumstance, the explication of which is very difficulty determinable, may here be brought forth, viz. how is an approximation to an æquilibrium of atmospheric temperature so continually maintained? The Sun is known to be the fountain of light and heat; and as such is acknowledged by all the animated offspring which he is destined to illuminate and exhilirate. The Parsees, &c. not only recognise him as the quickening and animating principle of this planet, but as their glorious object of religious veneration and adoration. At present, let the attention be converted to heat as the subject of reflection. Heat has been constantly proceeding from this glorious luminary, ever since he was placed on the golden chariot of Current Duration, and transmitted his enlivening influence to this terraqueous superfice. A legitimate inference also here arises, that notwithstanding this perpetual calorific emanation, his calefacient power continues unimpaired, although the quantity of heat disseminated by him through the universe surpasses all calculation.

LVIII. As lately mentioned, when cold was slightly considered, the fluctuating diminutions of temperature introduce what is commonly denominated *cold*, in all its variable proportions. And this suffers an exacerbation proportionately to the concomitant reducement of temperature. The commencement of a scale of temperature is not demonstrable; who can declare its beginning, or the incipient or nascent condition of caloric? or who display the line of demarcation of dryness and wetness? Who can show that subsisting betwixt absolute darkness and the commencement of illumination?—and a thousand other occurrences in the universe, which must be eternally inscrutable. The diminution of temperature, then, is succeeded, or rather accompanied with a lessening or decrement in the cubical measure of all terrestrial substances; and conversely, with its increase they take a simultaneous enlargement or expansion. This power has in all bodies an unconditional equipollency, in proportion to its intenseness; but hath a dissimilitude, or rather disproportion of operative influence, conformable to their individual or respective constitutional qualifications. Thus, it is different in the several kinds of aerial bodies, and in liquids, and also in the latter from that observeable in solidiform substances. This may be exemplified in its operation upon water at 212°, and upon iron at the same degree of Fahrenheit's thermometer. These, then, are remarkable circumstances in nature's kingdom, and contribute powerfully to some of the most important, both serviceable and mischievous phænomena and operations. The rarefaction of the atmosphere, either more partially or generally, is preparative to some of the most wonderful revolutions; such are all the winds, in their different intensities and remissions, continuance, regularity, inconstancy, and all their accidental properties and circumstances.

LIX. The temperature of the atmosphere is circumscribed, or constrained by a providential appointment, to a determinable extensiveness. It never surpasses a certain maximum of augmentation, nor goes below a given lowness of abatement. Either of these circumstances, if superlative, would prove particularly detrimental and destructive. This beneficially regulated circumscription, or confinement of the operation of heat, has been constantly maintained since the mundane structure revolved complete. How this beneficially apportioned temperature is consistently and unceasingly preserved, is apparently not easily explicable. It is understood among philosophers, that there is an everlasting commeatus among all the parts of the atmosphere. That portion of air between the tropics, or latitudes contiguous, is more rarefied or dilated than over any other part of the earth's surface; and thus, from a proportional diminution of its specifical heaviness, acquires a proneness to ascendency. For equalizing or counteracting (the one the cause of the other,) the reduction of its gravity, there is a constant influx of cooler and heavier air towards the equator; hence the occurrence of those continual breezes, the Trade-winds, so denominated by navigators. The previously expanded air is partly dispersed, and partly reduced to an equability of temperature, by mingling with the cooler and denser air newly arrived. The loftiest and lightest part of the air will probably be wafted along the upper regions of the atmosphere, and gradually inclined towards the polar boundaries. Continuing its progress, it will be imparting caloric to the cooler part of the air, and thus undergoing progressive condensation. This closeness, or approach of aerial particles at the poles, will be greatly increased. The natural inclination of this frigerated air will be towards the surface of the earth, and again to the temperate latitudes. In the retrocedent movements towards these regions, it suffers rarefaction; and, as formerly explained, it becomes specifically lighter, and thus assumes an ascending disposition. This interchange of circumstances is almost unceasingly, or rather perpetually, going on in the atmosphere.

LX. This reciprocal communication of temperature is conveniently and consistently explicable; but still the determinable confinement, or circumscription of atmospheric temperature, remains unexplained. If in tropical latitudes it were to receive a continual addition of caloric, then the poetical assertion might be realized. And if, on the contrary, in the other latitudes, its diminution should be excessive, then its opposite condition or state would, also, necessarily, become intolerable and destructive. It has already been observed, that the temperature of different countries, or even the territories of the same country, is regulated remarkably by the physical properties, or adventitious alterations and impressions of the surface. This circumstance has been, in every age of the world and state of mankind, always conspicuous. According to their nearness to the equator, or distance from it; according to their loftiness or lowness, &c.; so, dissimilar properties, in different countries, have continually subsisted. As in considerations of this description, in which the most remarkable things affecting prophylactic administration should not be overlooked, or overwhelmed by negligence, so, here, some remarks upon CLIMATE may be appositely introduced. The antecedent observations, however imperfect and abbreviated, will, in some degree, be contributive to the understanding of whatever notifications may hereafter be subjoined. There is such an intimate and important connexion betwixt the temperature and the peculiarities of the earth's surface, in constituting climate, in the plenitude of its signification and circumstances, that the examination of it will necessarily be rather diffuse.

LXI. All disquisitions are intelligible and advantageous, proportionally to the clearness of the apprehension of the particular or individual appellations; and thus a definition, or rather description of the term CLIMATE, is adviseable. This, it may be observed, receives part of its peculiar qualities from the degree of temperature to which it may be subjected, either constitutionally or incidentally. The ancients divided the general surface of the earth into five extensive expanses, which they denominated zonæ, and also cinguli; because they were supposed to surround or encompass the earth, in the manner they begirt themselves with their girdles; and which practice still continues peculiar to several eastern nations. They were, moreover, supposed severally to possess different portions of temperature, according to their relative nearness to the poles or equator. The primary or primitive part of mankind, which was induced to observe celestial and terrestrial phænomena, among which the influence and operation of temperature would undoubtedly challenge a share of attention, were inhabitants of generally temperate, but, occasionally, variable latitudes. And it is likewise a very allowable conclusion, that they would immediately understand the Sun to be the fountain of caloric and lumination. As, in those early days, their observations would be especially referable to those territories more constantly in exposition to the solar influence; and, indeed, as historically authenticated, particularly to those in the neighbourhood of the northern tropic, the warmer regions of the earth, therefore, became first to them familiar. As their excursions or wanderings would introduce them to places in which comparable lowness and highness of temperature would be distinctly remarkable, and gratefully or disagreeably experienced, comparative estimation of its variableness would be theoretically instituted. Deductions from attentive observations would gradually lead to imaginative comparison of temperature, as naturally occurring in different latitudes, physically variegated by their nearness to, or remoteness from, the equinoctial.

LXII. Ancient history supplies the information either more expressly or impliedly, that the people who then inhabited the earth were governed in their choice of situation from the moderate or favourable disposition of the temperature, and the attractive or acceptable properties of particular territories. These considerations were of the most remarkable importance to shepherds and husbandmen, who were led to change of place, conformably to the anticipation of improvement in their circumstances. In barbarous countries, where the natives are frequently not restricted to particular localities, it is still a common practice to roam, in consequence of prospective advantage. The combination of the favourable properties of the earth's surface, and the comparative gentleness of the temperature, constitutes one of the most commendable qualifications of any country or situation. The goodness or evilness of different countries or districts have been judged of, from their more sensible and apparent qualities, in every age, in the natural history of mankind. In this manner, those places which were considered to be insalubrious were commonly shunned as much as possible; and, contrarily, those which were deemed wholesome obtained the preference. This estimation, originating in convenience and advantage, being once practically confirmed, became the subject of remark with the historian, and also afforded business to the qualifying description of poetical faculty: "Regiones cœli neque æstuosæ neque frigidæ, sed temperatæ." "In Britannia loca sunt temperatiora, quam in Galliâ, remissioribus frigoribus." This appears to have been the opinion of Cæsar when he visited Britain. A sentiment somewhat different is announced by Tacitus the historian: "Cælum Britannicum crebris imbribus fœdum, asperitatem frigorum abesse." It is probable that the notice of Cæsar relates, especially, to the southern counties. This conclusion seems to be confirmed from his own historical declaration: "Insula (Britannia,) natura triquetra, cujus unum latus est contra Galliam: hujus lateris alter angulus, qui est ad Cantium, (hodie Kent,) quo fere ex Gallia naves appelluntur, ad orientem solem; inferior ad meridiem spectat." This description of Cæsar's seems abundantly satisfactory.

LXIII. As a reference to Britain has been contingently introduced, and as the declaration of Cæsar and Tacitus, in all probability refers, as already insinuated, to the more southern regions of the island, the following statement, as applying to it in modern times, may not be inapplicable or insignificant; and especially as it is extracted from a source of undoubted authority and authenticity. The observations relate to Devonshire. "The climate of this county varies very much in different districts; in North Devon, from the N. E. extremity to the southernmost cove in Barnstable or Biddeford-bay, snow seldom lies longer than a few hours; and the double-flowering myrtle, as well as the more delicate aromatic and narrow-leaved sorts, constantly flourish in the open air, and not unfrequently constitute a part of the garden hedges. The two following tables, taken, the one at Ilfracombe, situated on the coast," (about 51° 15′ N. and 4° 1′ W.) "50 feet above the level of the sea, the other at Oakhampton," (about 3° 42′ W. and 50° 50′ N.) "within a few miles of

Dartmoor forest, mark a very striking difference of temperature in two places not more than 35 miles distant from each other."

The average height of Fahrenheit's thermometer during the year 1806.

	At Ilfracombe.	At Oakhampton.	Difference.	Average.
For January,	53°	34¼°	18¾°	10½°
February,	48½	36¾	11¾	
March,	52	41¼	10¾	
April,	57½	43½	14	
May,	62¼	50¾	11½	
June,	64¾	55½	9¼	
July,	65¾	62	3¾	
August,	66	63¾	2¼	
September,	61¾	57¾	4	
October,	62¼	46¾	5½	
November,	58¼	41	17¼	
December,	56¼	39½	16¾	

LXIV. From this table, it appears what a notable difference of temperature occurs at two places naturally separated by a moderate distance. In the summer season the difference becomes less considerable; but, in August, the inequality comes to 2½° of Fahrenheit; so that now, the approaching equableness of temperature is conspicuous. By the foregoing statement, the remarkable difference of particular localities is strongly exemplified; and what differences may prevail in Britain, when its insular condition, and the irregularity and other circumstances of surface, are taken into consideration, are more readily conceived than explained.

LXV. It would likewise be considered by husbandmen and others, attentive in observing the difference of natural productions, as effectuated by the combined influence of heat, and the assisting and promoting circumstances of particular situations.

And now, in probability, mankind would begin to subdivide the earth's surface into districts, which, by a name originally intended to denote a certain extent of the visible heavens, " certus cœli positus," was transferred to the earth's surface. This application, probably, originally proceeded from the conception of the respective opposition of surfaces, and the particular influence which might be supposed to be imparted by the constellations of the zodiac. And this peculiarity, when applied to the earth, was considered peculiarly operative, according to their respective contiguity and opponent reference, &c. " cernis terram quasi quibusdam redimitam et circumdatam cingulis vel zonis." *Cic. Somn. Scip.* The moderns have divided these zones into degrees or climates, severally possessing a difference in the length of nights and days, and commonly variable intensities and mitigations of temperature. Climate, a term apparently deriveable from the root Κλινειν, (and more directly from Κεκλιμαι, perf. pass.) inclinare, declinare, &c. has a relation to the declination from the equator, and a continual inclination to the polar boundaries. As the term is transferred from its primitive application to the apparent inclination of the celestial superfice, and appropriated to that of the terrestrial,—it implies an imaginary, but not naturally graduated declension, constituting different latitudes, diminishing in temperature, but not uniformly or perpetually in proportion to their distance from the equator.

LXVI. The ancients employed the word climate to denote the different subdivisions of the earth's surface, as conceived to originate from the variation of annual revolution, the rising and setting of the principal heavenly luminaries, &c. In the more accustomed acceptation of the word, it is made to comprise an expanse of the earth's surface, remarkable for its difference of temperature; physical productions, their earliness or lateness; the particular description of characters by which a region or country is more especially qualified, in all its observeable circumstances; the different seasons in relation to their goodness or indifference, and a multiplicity of other considerations. In this manner, people may mention the climate of France, or of Spain, &c. and that of Britain. It may also be here observed, that these conceptions are constantly implicated with some comparison of the different circumstances particularly applicable to the respective countries. Geographers institute a distinction, by determining a climate to be—a space betwixt two parallels of latitude, in which, the difference of sunlight, in the longest and shortest diurnal revolution, is half an hour, calculating from its southern and northern terminations respectively. Twenty-four of these are said to be contained betwixt the equator and the arctic and antartic circles; and six from each of these to the poles. Sometimes the word climate was applied by the ancients, as Josephus, for example, to the regions of a particular country, *της ιουδαιας κλιματα*, without reference to the length or shortness of days, or other properties latterly incorporated with this appellation. In the generally employed meaning of the word, a very indistinct and imperfect sense is imparted. The condition of climate is naturally influenced by the original or accidental circumstances of particular places, as well as by the qualities of the weather.

LXVII. The variable state of temperature, according to physical exposure, and manifold other circumstances collectively considered, with the innumerable vicissitudes of the cœli temperies, or "weather;" the diversified properties of the earth's surface, as exposed to these different celestial expanses; all, in ordinary conception, conspire to the production of what is commonly called climate. The salubrious, or unhealthy disposition of particular climates, depends, interposedly, upon their original and physical properties and attributes; proceeding from their composition, arrangement, distribution, exhalations, chemical alterations, &c. &c.; and immediately upon a combination of more or fewer of these circumstances, with the superadded temperature and other atmospheric qualifications. And thus, particular territories, situations, &c. will generate and produce distempers peculiar to themselves; while a dissimilar assemblage of distempers, as occurring from the application and operation of common circumstances, such as temperature, in all its mutabilities and unexpected fluctuations; uncommon dampness, or, oppositely, unnatural dryness; breezes continuing in a particular course, and influenced in their qualities by traversing unhealthy surfaces, and embodying and sweeping along with them deleterious exhalations, &c. may occur in regions which are ordinarily deemed wholesome. The influence of these circumstances, in all their consequences, is so applicable to sailors and travellers, settlers or residents, in foreign countries, that it naturally constitutes an important consideration both to themselves and to those entrusted with the superintendance and management of their preservative administration.

LXVIII. The ascertaining of the importance, and the prevention of the effects of some of these circumstances, has employed the attention of statesmen, and the judgment of physicians; but, unhappily, general or common regulations and precautions will not, uniformly and invariably, accomplish such desireable purposes. The physical properties, concomitant and accidental revolutions of particular situations, demanding preventive management more immediately applicable to themselves. Some situations are naturally so unhealthy and pernicious to Europeans or others, that they are difficultly resistible, or sometimes irresistible by most constitutions. On this account, a practical conclusion may be instituted, of considerable advantage to people attempting to establish settlements, &c.; previously to ascertain some of the most important peculiarities of situations, before they incautiously and unguardedly expose themselves to their influence.

LXIX. Dr. Lind remarks: " From familiar observation, the fatal errors committed by the young and thoughtless, cease to excite our wonder; but we are apt to be struck with astonishment, when we find that the founders of great towns, and the governors of extensive provinces, through ignorance or mistake, have exposed populous and magnificent cities to an annual and pestilential destruction. This seems to be the case with Batavia; the Dutch, in endeavouring to make this their capital in India to resemble their cities in Europe, have adorned it with canals or ditches intersecting each other, and running through every part of it. Those canals, filled with water, may serve for some use, or perhaps, ornament; but notwithstanding the utmost care to keep them clean, in the hot and unwholesome climate of Java, during and after the rainy season, they become extremely noxious to the inhabitants, and more particularly to strangers. The unwholesome air of that place alone, has cut off more Europeans than have fallen by the sword in all the bloody wars carried on by the Dutch in that part of the world.

LXX. "It is remarkable, that in the war which terminated in 1763, the English ships of war which touched at Batavia, suffered more by the malignant diseases of that climate, than they did in any other part of India, if we except a fatal scurvy which once raged in that fleet at sea. Soon after the capture of Manilla, the Falmouth, a ship of 50 guns, went to Batavia, where she remained from the latter end of July to the latter end of January; during which time she buried seventy-five of her crew, and one hundred soldiers of the 79th regiment, who were embarked on board her; not one person in the ship having escaped a fit of sickness except her commander, Captain Brereton. The Panther, a ship of 60 guns, was there in the years 1762 and 1764, both times, unhappily, during the rainy season. In the year 1762 she buried seventy of her men, and had ninety-two of them very ill when she left the place. In the year 1764, during a short stay, she buried twenty-five of her men. The Medway, which was then in company with her, lost also a great number of men.

LXXI. "The fever was of the remitting kind. Some were seized suddenly with a delirium, and died in the first fit; none survived the attack of a third fit. The surgeon of the Panther imputes his preservation to taking as much of the bark every hour, in claret wine, as his stomach would bear, beginning the use of this remedy immediately upon the first remission of the fever. We may form some idea of the Dutch practice in this part of the world, when we find that, by the advice of four of their physicians, the bark was administered to Captain Matheson, of the Panther, notwithstanding a remission of his fever could not be procured; such was their confidence in that medicine. But that gentleman, with many of his men, fell a sacrifice to the intemperature of the climate. Nor was the sickness at that time confined to the ships; the whole city afforded a scene of disease and death: streets crowded with funerals, bells tolling from morn to night, and horses jaded with dragging the dead in hearses to their graves. At that time a slight cut of the skin, the least scratch of a nail, or the most inconsiderable wound, turned quickly into a putrid spreading ulcer, which in twenty-four hours consumed the flesh, even to the bone. This fact is so extraordinary, that upon a single testimony, credit would hardly be given to it; yet on board the Medway and Panther, they had the most fatal experience of it, and suffered much from it."

LXXII. In another place, Dr. Lind observes, that "During the sickly season at Batavia, a boat belonging to the Medway, which attended on shore every night, was three times successively manned, not one having survived that service. They were all taken ill in the night, when on shore, or when returning on board; so that the officers were at length obliged to employ none but the natives of the country on that business.—Great numbers of men have perished from being employed in this manner at Bengal, where the European ships often anchor in the most unhealthy parts of the river; and even when the great night fogs arise, after the rainy season, the men are often obliged to perform such night services in boats. Now, since it is so dangerous for Europeans in unhealthy countries, particularly during a season of sickness, to be exposed in an open boat to the foggy night air; it must appear, that sending them unsheltered, in open boats far up rivers, in unhealthy southern climates, for the sake of wood, water, trade, or other purposes, must be attended with the most destructive consequences.

LXXIII. "In the East Indies, and in the southern parts of Asia in general, we find, that the countries which are well improved by human industry and culture, such as China, and several other places in that part of the world, are blessed with a temperate and pure air, favourable to the European constitution. On the other hand, the woody and uncultivated parts, such as the islands of Java, Borneo, and Sumatra, the coasts of Arakan and Pegu, the islands of Negrais, where the English lately attempted to make a settlement, Banda, one of the Dutch spice islands, and several others, have proved fatal to a multitude of Europeans and others, who have been accustomed to breathe a purer air. In all parts of the East Indies situated near large swamps, on the muddy banks of rivers, or the foul shores of the sea, the vapours exhaling from the putrid stagnated water, whether fresh or salt, from the corrupted vegetable and the other impurities, produce mortal diseases, especially during the rainy season. There is a place near Indrapour, in Sumatra, where no European can venture to sleep one night on shore during the rainy season, without running the hazard of his life, or at least of a dangerous fit of sickness;

and at Podang, a Dutch settlement on the same island, the air has been found so bad, that it is commonly called the Plague Coast. Here a thick pestilential vapour or fog arises after the rains, from the marshes, which destroys all the white inhabitants." —These observations, extracted from Dr. Lind's book on the Diseases incidental to Europeans in Hot Climates, may suffice for illustration and confirmation of what is stated in these disquisitions.

LXXIV. As this is a subject of importance, it may be allowable to insert the following observations of Dr. Lind, on the Signs of an Unhealthy Country. He mentions: "Before giving directions for the preservation of Europeans in unhealthy countries, it will be proper to enumerate the most certain signs or proofs of an unhealthy country.—The first proof of an unhealthy country, is a sudden and great alteration of the air at sunset, from intolerable heat to a chilling cold. This is perceived as soon as the sun is set, and for the most part is accompanied with a very heavy dew. It shows an unhealthy, swampy soil, the nature of which is such, that no sooner the sunbeams are withdrawn, than the vapour emitted from it renders the air raw, damp, and chilling, in the most sultry climates; so that even under the equator, in some unhealthy places, the night air is cold to an European constitution.—The second is, thick noisome fogs, arising chiefly after sunset, from the vallies (valleys), and particularly from the mud, slime, or other impurities. In hot countries, the scent of these fogs may be compared to that of a new-cleaned ditch. Diseases, therefore, arising from this cause, generally take place in the night, or before sunrising.—The third is, numerous swarms of flies, gnats, and other insects, which attend stagnated air, and unhealthy places covered with wood.—The fourth is, when all butcher's meat soon corrupts, and in a few hours becomes full of maggots; when metals are quickly corroded on being exposed to the open air; and when a corpse becomes intolerably offensive in less than six hours. These are proofs of a close, hot, and unwholesome spot. In such places, during excessive heats and great calms, it is not altogether uncommon, especially for such Europeans as are of a gross habit of body, to be seized at once with the most alarming and fatal symptoms of what is called the yellow fever, without even any previous complaint of sickness, or other symptoms of the disease. There has first been perceived an uneasy itching sensation commonly in the legs; and upon pulling down the stockings, streams of thin dissolved blood followed: a ghastly yellow colour quickly diffused itself over the whole body; and the patient has been carried off in less than forty-eight hours.—The fifth is, a sort of sandy soil, commonly a small, loose, white sand, such as that at Pensacola, Whydah, and the island of Bonavista, which is found by experience to be injurious to health.

LXXV. "The pestiferous vapour arising during the summer months, in the heat of the day, from such a sandy soil, is best characterized by its effects in the extensive deserts of Asia and Africa. It there constitutes what is called the Samiel wind, a blast, which in the parched desert proves instantly fatal both to man and beast; but when it passes over a soil covered with grass and vegetables, has its effects greatly mitigated; it is even then productive of sickness: thus the southerly winds, while they blow from the deserts of Lybia, during the summer, at Algiers, Tunis, and Tripoli, produce an unhealthy season. And at Madras, the winds which in the months of April and May pass over a large tract of sand, are always hot, disagreeable and unwholesome. During these land-winds, sudden gusts of a more hot and suffocating nature are often observed to come from those sands, once or twice, or even more frequently in a day, which seem to be this vapour in a purer form. These gusts pass very quickly, and affect persons who happen to be standing with their faces towards them, in the same manner as the hot air which issues from a burning furnace, or from a heated oven, and obliges them immediately to turn from it, in order to recover breath. The effect of this hot suffocating blast or vapour on the human body, even when mitigated by passing through a moist atmosphere, is the same as that of intense cold; it shuts up every pore of the skin, and entirely stops the perspiration of such as are exposed to it. They come only in the daytime, and always from the deserts.

LXXVI. "Water is the only known antidote or corrector of this vapour; hence coarse thick clothes, kept constantly wet, and hung up at the windows or doors, greatly mitigate its violence. A house so built as to have no doors or windows fronting the deserts, affords also an excellent protection against its pernicious effects. The hot land-winds constantly blow at Madras and other places of the coast of Coromandel, at that season, from midnight till noon; the sea-breezes then begin, which relieve the difficulty in breathing, and the obstructed perspiration which the former occasioned. That the heat of those land-winds, as also of the sudden gusts which accompany them, proceed from large tracts of sand being heated by the sun, is evident from the increased heat and suffocating quality of those winds in proportion as the day advances, and as the heat of the season increases.

LXXVII. " The opposite qualities of the winds, blowing from each side of the Balagate mountains, are a farther proof of this. These mountains, running from north to south, divide the hither peninsula of India into two unequal parts, and separate what is called the Malabar from the Coromandel coast. To the former they are very near, but at a great distance from the latter. The winds blowing from these hills, are on the Malabar coast always remarkably cool; but on the coast of Coromandel, in the months of April, May, June, and July, are extremely hot and suffocating; as they pass over a large tract of intermediate sand, heated during these months by an almost vertical sun. Hence the Malabar coast is always clothed with an agreeable verdure; whereas the Coromandel coast, during the continuance of those hot winds, seems a barren wilderness, nothing appearing green except the trees. On the contrary, the winds that pass over those sands, after being wet with the rains, are the coldest which blow at Madras. It is an observation of the natives on the coast of Coromandel, which is confirmed by the experience of many Europeans, that the longer the hot winds blow, the healthier are the ensuing months; these winds, as they express it, purifying the air. Are not the winds, therefore, the cause why the air on the coast of Coromandel, except during their continuance, is more healthy than in other parts of India, where these winds do not blow? Does not this also suggest a very probable reason why the plague in Egypt generally ceases in the beginning of June? The periodical hot winds, which come from the deserts of Nubia and Ethiopia, having then rendered the air of Egypt pure and wholesome. Many have ascribed that effect to the north winds, as the plague not only ceases when they blow, but all infected goods, household furniture, and wearing apparel, are then said to become entirely free from the contagion; these, however, cannot be the cause, as the most destructive plague is abated in its violence, if not wholly eradicated, before they set in. With equal propriety we may reject the opinion, that the overflowing of the Nile is productive of that salutary effect, as the plague generally ceases before the increase of that river is perceptible."

LXXVIII. Thus far the valuable observations of Dr. Lind; but his conclusions are not applicable to every region of the earth's surface, nor even always to those regions which should be, or at least reckoned to be, occasionally unwholesome. The influence of some tracts, or spots of country, is greatly modified by the season of the year, and other changeable circumstances. In the warmer seasons of the year, the summer and autumn, for example, many places may generate and diffuse pestiferous exhalations, which, in the colder seasons of the same places, may have little or no injurious operation. In many situations, no mischievous exhalations are troublesome during the intense cold of winter; or, while they are confined and barred down by frost, lose all influence upon the human constitution. But, as soon as they are exposed to a sufficient degree of heat, they begin to evolve and disperse their deleterious vaporations. In this manner, several places are capable of producing intermittents at particular seasons; and, again, at others, when shut up in the way aforesaid, are incapable of exciting any perceptible morbiferous consequences. In many marshy, miry, &c. situations, while they are wholly overflown, no evident inconvenience is generated; but, as soon as part of them are exposed by exhalation, they immediately commence their peculiar operations. And, when they are completely exsiccated by the force of solar heat, they also become harmless.

LXXIX. A description of particular countries, therefore, with their commonly attendant properties, as affecting the healthiness and happiness of those unaccustomed to their impression, would involve an amplitude of examination and discussion altogether unnecessary, and, indeed, unsuitable to the spirit of this undertaking. Concerning the peculiarities of particular settlements, such authors as Dr. Lind may be most usefully consulted. Some other remarkable, and universally operating circumstances, will here be more especially the subjects of consideration; and of these heat, as being one of the most generally diffused and powerful in nature, requires some additional examination. The general operation of atmospheric temperature upon animate structure, is qualified and modified by almost innumerable circumstances. Animals, it may be observed, ordinarily subsist most conveniently in the regions in which they are natively produced. This is so strongly exemplified in some animals, that they scarcely tolerate to be transferred from one country to another; and, particularly, when the difference of temperature is considerable. A consideration of this description, seems to be a confirmation of the inexplicable but preservative qualification, gradually engendered and ultimately established in the constitution, and afterwards hereditarily transmitted. For illustration, if a Russian or Laplander were immediately translated from his native to a tropical climate, he would receive its impression in a manner which might be speedily destructive. Transmute the illustration, and remove a native of the torrid zone to the frozen regions of the polar circle, and he would be grieveously affected, and quickly killed by their chilling operation. These transmutations, if they admitted of instantaneous exemplification, would powerfully exhibit the prejudicial consequences of the diminution and augmentation of temperature.

LXXX. "Calor omnia corpora laxat, expandit, frigus vero densat, durat, utrumque effectum homines probe experiri solent. Quamvis corpus secum fere semper calorem conservet, fieri nequit, quin ejus superficies saltem ab aere ambeunte externo afficiatur: neque minima vis est, quam calor hoc modo in universum corpus edat. Quantum differt homo, qui Austro expositus, hebes, languidus factus, membraque ægre trahat, ab illo qui sub frigido Aquilone cursu glaciali se exerceat, universum corpus firmus, mobilis, expeditus." But if the forementioned transition is more deliberately performed, the consequences are not so intolerable and immediately mischievous. Vicissitudes of temperature, and every accompanying circumstance, are ordinarily productive of unpleasant and prejudicial consequences, in proportion to their comparative extensiveness, the suddenness of their appearance, their unexpected interchange, their shortness or continuance, &c. A duplicated consideration contributes to the explanation. The constitutional inaptitude, or incapability of undergoing these precipitate mutations, without suffering a proportionate inconvenience; and also their unexpected application to a person unprepared; this very frequently happens to seafaring people, nam præmonitus, præmunitus.

LXXXI. And now it may, perhaps, be somewhat entertaining and instructive, to enumerate the most ordinarily observeable effects of heat on those who have not been previously familiarised to this exposure. As they gradually depart from the cooler or temperate latitudes, (supposing them originally from northern countries, and not beforehand accustomed to tropical climates,) and approach the tropical, the temperature is, for some time, under progressive augmentation. The thermometer at sea, and when properly defended from the undue operation of caloric, perhaps rises to 80° or 82°; and, in the influence of insolation, to 115°, or even to 120° of Fahrenheit. This latter point of elevation it seldom surpasses; and the former, rarely, excepting in some harbours, or in narrow channels, in which it may sometimes ascend, even under coverture, to 86° or 90°; but this is, comparatively, an infrequent occurrence. This circumstance, however, is produced and regulated by the contiguity and influence of islands, or an adjacent continent. This is strikingly exemplified in the Mediterranean, where the water of that ocean is warmed several degrees above that of the Atlantic; and partly for this reason, the latter seems to flow into the former at the straits of Gibraltar. This is, then, an increase of temperature, which many of the northern natives have not hitherto experienced. The occasional and transient augmentations of warmth, which they have felt in a northern summer, can scarcely be admitted as exceptions, or as capable of preparing and qualifying them for the endurance of the unceasing operation of heat in tropical climates.

LXXXII. At the beginning of this increment of temperature, unwonted feelings are induced, variable in different people, and which do not conveniently admit of intelligible description. The cutaneous surface, from being previously contracted, and apparently unmoistened, becomes soft, moist, seemingly more delicate and pliable; and sometimes a degree of mental hilarity, but, in some individuals, its opposite is perceptible. In others, again, (modifiable indeed by the state of the constitution,) languor, some drowsiness, listlessness, irresolution, diminution of willingness and readiness to application, and disinclination to perseverance, are more remarkable. The subcutaneous blood-vessels become more distended and conspicuous; a gentle breathing moisture, sometimes profuse sweating, appears on the surface; and, perhaps, some sense of fulness and distension is felt at the sensorium. Some of these symptoms happen more especially in plethoric people, or in those who are labouring under slowness of the intestines, or who ingurgitate improper quantities of vinous or distilled liquors, or offending quantities of alimentary substances; or who carelessly expose themselves to insolation; or who, from lubberly laziness and want of employment, waste their precious moments in loitering and the recumbent posture. The conception of caloric possessing such operation upon the human body, may, according to the judgment of many, be considered as groundless and imaginary. It may be viewed as conveying and implying a mechanical notion of the whole business, and, therefore, impugned as not consistent with any of the doctrines of the functions, properties, and susceptibilities of organized composition. Animal structure, however, is not altogether excepted from the influence of this mightily operating substance. The fluids and solids of the body are affected with expansion or densation; although it is honestly confessed, that these occur in a very diminutive proportion; and, generally speaking, are not observeable. And, it is commonly known, that the natural measure of the whole corporeal building, is susceptible of a difference of its absolute constituent magnitude.

LXXXIII. The internal temperature of the living human body may be considered as amounting to 100°; although it has been confidently maintained, to be only about 98° of Fahrenheit. From 96° to 97°, or 98°, is the most ordinary temperature of the surface. In pyrexia, the superficial heat is sometimes raised to 105°, or even to 107° or 108°; but the last is an infrequent phænomenon. What alteration is introduced by this important aggravation of temperature? is it superficial, or does it follow an equability of dissemination throughout the constitution? This extraordinary augmentation of constitutional temperature, never occurs but in combination with indispositions of particular descriptions, when many of the actions and functions undergo very important, and, frequently, inexplicable departures and inclinations from their natural and healthy standard. In all the moderate alternations of atmospheric temperature, the body itself, during health, generally preserves an uniformity of temperature; and, when the ambient warmth becomes considerably exasperated, its consequences are ordinarily counterpoised by the evaporation from the surface. This must be increased according to the augmentations of temperature, and the necessities of the individual in exposition. This operation, which is so indispensable, both for the comfort and safety of man, is in some measure regulated and performed upon the principles of rarefaction or expansion ; and, ultimately, the frigerating consequence of evaporation. The liquids may be rarefied, then evaporated, and consequently be prodigiously augmented in their positive volume; and, from the removal of a large quantity of caloric, become the cause of refrigeration. Reduction of the aerial closeness, which is an immediate consequence of the expanding influence of caloric, appears to cause a dilatation of the liquid contents of animals; and hence, in some degree, the feelings of uneasiness, languor, oppression, and weariness, sometimes preceding the appearance of perspiration, are explained. This conceivable expansion is occasionally observeable, or rather occurs in those who ascend elevated mountains, and in whom the accustomed proportion of temperature is duly generated, and systematically disseminated; but, from the peculiarity of the situation, the necessary atmospheric compressure is diminished. The consequence is, the supposed expansion; but which, as already mentioned, will certainly be commanded and overruled by the principles of animation, and the governing capacity of animated structure. A sense of heaviness on the respiration, hæmoptysis, headache, giddiness, &c. are some of the superinduced phænomena; and even in persons who previously showed no proneness to such complaints.

LXXXIV. As the temperature becomes higher, the lassitude, indifference, and irresolution for locomotion, in some individuals, become still more troublesome; the cutaneous transudation is augmented; the intestinal discharges in many become more infrequent; the quantity of urinary secretion is also commonly diminished, sometimes even to a quarter of its customary quantity; and, in some diseases, or affections of the organical structure, &c. concerned in separating, receiving, conveying, or rejecting the urine, an increment of the mischief is often produced. The perception of fulness and gravitation, with uneasiness, and repeatedly intervening propensity for its evacuation, are sometimes troublesome.

LXXXV. The following observations of a gentleman long conversant in the matters of seamen, and who, while actively employed as physician to the fleet, laboured strenuously for the introduction of improvements, may here serve as illustrations. "In the summer season, and in warm climates, the orlop deck, in some corners, comes very near to a *vacuum.* This I experienced, in my cabin, on board the Vengeance, in the West Indies, in 1793. Immediately upon putting my head into it, the vapour burst from my face like a heavy dew; and, on entering it bodily, it seemed to gush from every pore. My sleep was often disturbed, chiefly from thirst. The quantity of water that I drank in the course of the night was uncommonly large; frequently six quarts; . . . yet, at this time, I could sit at ease in the Purser's cabin, on the opposite side of the cockpit, which was better ventilated, by the ladder conducting a current of air from the hatchway. The quantity of liquid which I consumed in the course of twenty-four hours, was about nine or ten quarts; urine, about four ounces. Had I continued the twenty-four hours in my cabin, the liquids must have exceeded sixteen quarts."

LXXXVI. It may not, perchance, seem presumptive or superfluous, to recommend to those unaccustomed to the observation and management of the complaints commonly prevailing in the warmer climates, the propriety and usefulness of distinguishing those anomalous symptoms, originating accidentally from the influence of augmented temperature, from those symptoms caused by some other circumstances. The tongue is frequently covered with an unpleasant foulness; the sense of taste is often depraved, imperfect, or perverted; and, when the bilious secretion is copiously supplied and propelled into the duodenum, or, as many times happens, is regurgitated into the stomach, a feeling of disturbance, warmness, sickness, heaviness, &c. is frequently the cause of annoyance in the seat of the stomach and forenamed intestine. These deranged sensations are also commonly attended with impaired appetite, inclination to vomiting, oppressive headache, giddiness, inquietude, wakefulness; and, if the person has been labouring, and improperly or carelessly exposed to insolation, the headache is materially aggravated with throbbing or thumping in the temples. The eyes become suffused; sometimes prominent, and glistening with uncommon splendour; and, exposure to a bright light causes considerable uneasiness. Ruddiness of countenance, in variegated proportions of coloration, confusedly and strangely intermixed with paleness, &c. are oftentimes observeable. The features are sometimes inflated or expanded; at others, the visage exhibits an appearance of weariness, obscureness, and muddiness, which, to the experienced, are particularly characteristic; and are, now and then, very unfavourable circumstances. The arterial pulsations are, in these instances, generally numerous, forcible, and bounding, &c. When all these symptoms, or even a principal assemblage of them, present themselves, medicinal assistance should not be neglected. The intestines should be unloaded with all possible expedition, both by judiciously exhibiting cathartics, and applying purgative clysmata. If the power of swallowing is suspended, the chief dependance must be on the latter; but, blood-letting, unless imperiously and unavoidably requisite, is ordinarily not adviseable. An equivalent advantage is frequently otherways obtainable, and with much less subsequent inconvenience than what would arise from phlebotomy. The person should be retained in the sitting posture, or certainly with an inclination as nearly approaching the perpendicular, as consistently admissible. The cool affusion will now be particularly commendable; and, if knowingly applied, will, generally speaking, be almost immediately beneficial. The use of this remedy must be regulated in its application, conformably to the circumstances of different examples. The affusion upon the head and shoulders will, in common, be the best mode of application, and will prove the most serviceable. The continuance and impetuosity of its application, must also be determined by its immediate impression, and the apparent consequences. In the tropical latitudes, the use of the aqueous affusion can seldom be unsuitable or inconvenient. The temperature of the water, possessing such nearness to that of the atmosphere, may be one cause of its inefficiency; or, at least, of the comparative slowness of its advantages.

LXXXVII. A most remarkable property of animated structure, is the intrinsical and unborrowed capability of disentangling, supporting, and maintaining an evenness or uniformity of temperature, even in extremely diversified fluctuations of it, in surrounding substances, as demonstrated by the thermometer. As, for example, in such an extensive and unexpected difference as is interposed between the commencement and the 212° of Fahrenheit's thermometer. Some irksome, and rather dangerous experiments, have shown the possibility of existing, for a short time, in air heated to the standard of boiling water, or an apparently more insupportable temperature. And what would appear to be incredible, the human body has transiently the power of maintaining its accustomary temperature in the intense colds of Siberia and Greenland, &c.; in which countries, the thermometer has been observed more than 100° below the beginning of the thermometric scale; and in the burning regions of Africa, Arabia, &c. where it rises to 120°, 130°, or even more, in the solar influence. It has been observed, that human beings can exist, for a short time, in apartments heated to 260°; and in stoves, heated for the purpose of exsiccation, where the thermometer stood at 290°; and, in this manner, a heat of 270° has been borne for a quarter of an hour. The amazing heat of 315° has been endured for five minutes. It appears, that in this manner, persons have endured the heat in which meat and fruit were baking. Some allowance, it is naturally supposed, must be made for the uncertainty of the indications in spirit thermometers, in these apparently insupportable degrees of temperature. It has been ascertained, from experiment, that both the glass and the spirit suffer progressive expansion, proportionally to the augmentation of temperature. It is stated, upon the authority and credibility of some who have been in Egypt, that from September to October 1798, the highest heat at noon was 89½°; from November 1st to November 24th, 77°; from January 1st, 1799, to February 28th, 72½°. In the month of May, 99½°; June, 105°; July, 100⅔°; and August 1—16, 98½°. It is reported, that on the 5th September, when the thermometer was dipped in the sand, at noon, opposite to Thebes, it rose to 154°; and it stood at 100° under coverture. In Egypt, it has been observed at 108° or 110°, even when defended from direct solar influence.

LXXXVIII. When the lowest degree of cold, already mentioned, is taken into calculation, with the highest elevation of temperature lately specified, which is tolerable by the human constitution, the whole continuous range of temperature which has been endured, will amount to 370° of Fahrenheit's thermometer. And, if what has been already mentioned be applicable, that the temperature in some of the northern (and, probably, still more especially in the southern,) regions, has been observed at –100°, or one hundred below the beginning of the scale, be added to 315°, the aggregate would form an uninterrupted arrangement of atmospheric temperature, amounting to more than 400°, which constitutes a difference betwixt the terminating extremes; which, unless its likelihood were corroborated by experience, or experimental investigation, would necessarily appear to be intolerable by the human constitution. This surprising ability of resisting the destructive influence of such undue warmth, will be more conveniently explainable by those who comprehend the difference of the action of water and of air, of seemingly the same temperature, as represented by the thermometer, and the way in which the human body maintains its æquilibrium, amidst that of atmospheric variableness. The most ordinary gradations of atmospheric temperature, to which mankind are commonly exposed, are from 10°, 20°, &c.; below 32°, up to 90°, 96°, 120, &c.; which last is not so often surpassed. In extraordinary, or very uncommon exposure, the difference may be still more remarkable, as has been illustrated, and consequently more important. The retrogression and progression may fluctuate from 45° -0°, + 120°. Here is a difference or inequality, including the ascending and descending, of 165° of continuous arrangement of thermometrical admeasurement. These differences are so extensive and powerful, that if the more remarkable were to be immediately, and perhaps instantaneously consecutive, they must be almost irresistibly destructive. In the greatest lowness of temperature, an animal in vigorous health and strength, may for a moment resist; but, from the impossibility of generating the necessary and customary proportion of systematic temperature, the impression must be almost instantly intolerable; and consequently life, in such circumstances, is not maintainable. The opposite extreme may be longer endurable; but will, also, from its powerful influence, be sooner or later detrimental and mortiferous.

LXXXIX. The wonderful power of different animals, in opposing or resisting the dangerous operation of lessened heat, (cold, correlative to the diminution of calorific efficiency,) is indirectly an evidence of the copious quantity of heat which they must perpetually disentangle, and throw into the circumambient atmosphere. When exposed to high heat, the animal dissipates its superfluous temperature through the intervention of perspiration, and the pulmonary exhalation, as shall shortly be more particularly illustrated. And, contrariwise, when exposed to lowered warmth, it is chiefly expended upon the cooled air, in contiguity with the surface. Many times both circumstances, however, may act conjointly in the production of this requisite refrigeration. In the temperate latitudes, this is the most ordinary mode in which this change is most conveniently and wholesomely superinduced. The temperature of man, (who is directly intended as the ultimate subject of these discussions,) is principally or exclusively dependant on the functions of respiration, which is the productive, or, at least, principally regulating circumstance. The suitable and healthful performance of this vital process continuing, there is, generally, an evenness or equality of constitutional temperature. How, or in what manner, the pulmonary apparatus accomplishes its wonderful operations, is not sufficiently understood. The absolute warmth of different animalsis, ordinarily, governable by the proportion of air they may respectively use and decompose in respiration. Some animals—birds, for instance—have a higher temperature than man; and this chiefly depends upon the frequency of their respiration, and, consequently, the employment and decomposition of a larger share of the atmosphere; but whether the assigned cause and effect hold, *cæteris paribus,* an invariable correspondence, is not so easily determinable. Some, again, of the largest breathing animals, which are naturally inhabitants of the deep, and using comparatively a small quantity of air, are nearly of the temperature of the fluid in which they live; and which is well known to be many degrees below that of mankind.

XC. In modifying and regulating of animal temperature, the surface must be taken into consideration. There is a peculiar relation subsisting betwixt the pulmonary apparatus, and the performance of respiration, in all its extent of signification and importance. Animals inhabiting the temperate or colder regions of the earth, are almost continually, or rather perpetually, living in air considerably below their own temperature. Although thus situated, they regularly preserve an equability of internal temperature. This regulating calorific property, depends upon operations accomplished by the animal functions upon the air inhaled in respiration, without any extrinsical assistance; unless, as just said, a determining superficial action be allowable. When the temperature of the atmosphere is moderate, there is, for the most part, *cæteris paribus,* no observeable cutaneous exhalation. The surface frequently appears to be contracted, and the general bulk of the different members, which may have been most in exposure, seemingly rather diminished. The blood-vessels at the surface are collapsed, so as oftentimes not to be perceptible. The more inward are then replenished and distended, in proportion to the contraction of the more external. This commutation of receiving and containing capacity, is, fortunately, constituted in the sanguiferous contexture; and is very frequently and beneficially acting in the living constitution. This is more than a plausible supposition; it seems to be the legitimate explanation of the occurrence; or, otherways, how is the alternation to be understood. Some of the consequences of this retropulsion, are a sensation of fulness, and sometimes distension or oppression, in the chest, and sluggish weight in the abdomen, &c. The intestines, too, are generally more regular and complete, in the performance of their functions and requisite periodical discharges, in the moderate than in the tropical climates. There is also, very commonly, a larger secretion and excretion of urine, in the colder than the warmer countries. The inclination or disposition to inflammatory complaints is more particularly remarkable; pneumonia, consumption, rheumatism, catarrhus, cynanche, &c. &c. are the most predominant, troublesome and destructive. Such distempers, in tropical latitudes, are comparatively infrequent; especially amongst the aboriginal inhabitants. In the colder and temperate latitudes, moreover, the appetite for animal matters is commonly more extensive and insatiable; and, contrarily, vegetables, such as fruitage, are more desireable and acceptable to the natives of the middle zone, or ordinarily intemperate latitudes.

XCI. Two circumstances, of very dissimilar qualification, are powerfully contributive to the regulation and subtraction of unemployed or superfluous animal temperature. The first thing is the comparative coolness or coldness of the air, when its sensible heat is considerably below that of the human standard—which is generally estimated at 98°—and which is more immediately applicable to what may be denominated the superficial temperature. The second consideration is, that in the augmented heat of tropical climates, and in any situation, when such a thing may happen; by the expiration, and consequent exhalation or evaporation, from the cutaneous surfaces. This refrigerating process is, moreover, in all likelihood, aided and accommodated by the vapour from the bronchia, during the decomposition of the air used in respiration. As before observed, caloric possesses a continual and irresistible inclination to an æquilibrium, or evenness of distribution or dispersion, among surrounding objects, until an apparent uniformity of temperature is the consequence. An exception, however, to this generally allowed and sweeping assertion, is presented by all those animals, which constantly and needfully exercise the function of breathing; and whose warmth, if they are not wrought upon by extraordinary circumstances, maintains nearly an equipoise in all the less uncommon fluctuations of atmospheric temperature. This is a phænomenon, regulated by principles which are not applicable to inanimate substances.

XCII. The air, in the colder regions, is constantly and expeditely inclined to receive, and therefore to remove, an additional quantity of caloric, whensoever this is accidentally imparted; and thus the portion of animal temperature which is not appropriated, or is eventually unnecessary, is perpetually and conveniently transferred from the superfice. This disengagement of heat, and also its dissemination into the encompassing atmosphere, is thus continually and serviceably accomplished. The quantity of caloric extricated, manifested, and ultimately dissipated, by the animals which are commonly said to be warm blooded, must be very extensive, and not reducible to the grasp of calculation. This, indeed, is a circumstance in the natural history of animals, which has, hitherto, not been sufficiently investigated by philosophers. A consideration of importance undoubtedly it is, however, in the management and preservation of healthiness, to have some notion of this remarkable circumstance. This commodious and advantageous expenditure of superabundant heat, is, therefore, a demonstration of the suitableness and agreeableness of moderate temperature, for the healthiness, happiness, and even longevity of mankind. Their unapplied temperature, (or its unintermitting superfluity,) is thus regularly dismissed, without the intervention of perceptible perspiration, and many of its unpleasant consequences are thus beneficially contravened. An animal process or operation, &c. (or under what designation soever the same may be understood,) generating and maintaining only an inclusive æquilibrium of temperature, is not the whole of this living animal qualification. The proportion continually disentangled must greatly exceed the comprehension or extent of this hypothesis; and a quantity, in the present state of knowledge not determinable, must be transmitted from the animal's surface into the surrounding atmosphere. Every time the garments are removed from the surface, or any considerable evacuation, &c. takes place, some accumulated caloric is thus conveyed from the body. The state and proportion of perspiration will also be modified by the amount of the circumambient atmospheric compression, in combination with that of the simultaneous superficial temperature. The principal productive cause is the expansive power of caloric. The readiness and quickness of its evaporation are governable by these and other circumstances, such as the transferring or conducting quality of the atmosphere.

XCIII. The portion of air contiguous to the body's surface, and especially if the atmosphere be motionless or undisturbed, undergoes expansion or rarefaction by additionally communicated temperature; and is afterwards displaced, and substituted with air in possession of properties opposite to those just now particularised; and this cooler or denser air now approaching the surface, receives its allowance of the caloric, which continues to be disengaged. This operation, therefore, is continual, as long as the forementioned circumstances of the atmospheric temperature, &c. remain unchanged. The perspiration in the cooler climes, unless the person has been laboriously employed, or otherways unduly excited, is ordinarily so inconsiderable and imperceptible, that it has, by philosophers, and even by anatomists, &c. been styled insensible perspiration. These two specified circumstances, however, frequently act in combination, in producing the general effect of transmitting superabundant temperature; and in this manner, both in health and indisposition, cause the most beneficial consequences. In all degrees of temperature below 60°, either of these, by itself, or in conjunction, appear to be the means and common method employed by nature for frigerating and equalizing the temperature of her animated offspring. This continual avolation of redundant heat, it is conceivable, must be counterpoised by an unceasing constitutional action, or probably the effect of a change going on in the lungs, and in the subsequent sanguineous circulation. At the temperature last named, and lower degrees, perspiration, at least in a remarkable quantity, is not required, unless respiration has been mechanically accelerated, or the force or frequency of the circulation has been considerably augmented. The consequence of these circumstances is a corresponding disengagement or evolution of animal heat; the removal óf which now becomes necessary, and which, as may be sufficiently understood, is regulated by the perspiration and pulmonary exhalation; allowance being still made for the exact proportion of accompanying diminution of temperatnre.

XCIV. The atmosphere, then, so far, constitutes an accommodating intermedium for the refrigeration of animals, and, at same time, for the preservation of their equability of temperature. In proportion to the air's expansion and correlative lightness on the surface, the vascular apparatus appointed, or practically applicable for the performance of perspiration, acts with more promptitude; the resistance to the exhalation is diminished, and the evaporation, and consequently, the refrigeration go on with comparative acceleration and convenience. All these together, with some other circumstances, then happily co-operate, when necessity most commands, in cooling the body; and thus indirectly act in maintaining an æquilibrium of constitutional temperature. That evaporation from the surface is powerfully conducive to an equability of temperature, seems to be both a reasonable and an undeniable conclusion. Chemical experiment, as already observed, has sufficiently demonstrated, that a large quantity of caloric is embodied with liquids or solids, when they are converted into vapour, or continuing the act of vaporation. This appropriated, or incorporated quantity of caloric is withdrawn, disappears, and is afterwards not ascertainable, nor even appretiable, by the thermometer. That the quantity of caloric has entered into combination with the liquid, during evaporation, is, from all circumstances, an occurrence indubitable, or can indirectly admit of a proof, amounting to the most steadfast and resolute of all affirmations—demonstration. Superfluous animal temperature is thus conveniently incorporated with the perspiration, and is extensively instrumental in preserving comfortable coolness and regularity of temperature.

XCV. A very intimate connexion is continually subsisting betwixt the corporeal surface and pulmonary apparatus. In the lungs, the air inhaled undergoes decomposition, and, also, probably afterwards, in the course of the circulation; and new arrangements, adjustments, &c. are subsequently introduced. The pulmonary exhalation, or what is commonly called the breath, is known to contain carbonate of oxygene, and aqueous vapour. The quantity of caloric incorporated and conveyed in this exhalation, is also assuredly extensive. Different opinions have been variously entertained, concerning the generation or production of animal temperature; but it is, unluckily, a subject of difficult examination, and, at present, may be said to be embarrassed in a state of perplexity. Some suppose the calorific operation to be principally, if not wholly, accomplished by and in the Pulmonary Structure, and then gradually diffused and regulated in its systematic distribution; and, it may be subjoined, its conclusive expenditure. Others have supposed, that it is equally and generally disengaged, in the progress of the circulation. Dr. Crawford's hypothesis seems the most ingenious; but no theoretical explanation appears to be of sufficient exactness, even to bear comparison with probability. In all likelihood, the operation is begun in the lungs, and afterwards perfected, or completed, in the different channels of circulation, by the intervention of the animo-chemical alterations, thus progressively and successively effectuated.

XCVI. "It is to be stated, as an important fact, independent of all theory, that the changes which take place in respiration, are considerably influenced by external circumstances, and by causes which seem to affect the chemical changes of the living system. Crawford found, that less oxygen is consumed by respiration at a high, than at a low temperature; a Guinea pig, for example, not vitiating above half the quantity of oxygen, in air in which it was confined at the temperature of 104°, which it did in the same air at 55°. This was confirmed in the experiments of Lavoisier and Seguin: a man consuming, at the temperature of 54°, 1344 cubic inches of oxygen in an hour, while, at the temperature of 79°, he consumed only 1210 cubic inches. De la Roche obtained, in experiments on different warm-blooded animals, the same result. Crawford observed, also, that, in an animal placed in a warm medium, the venous blood approaches to the arterial in colour: in a dog, for example, surrounded with water at 114°, for half an hour; at which time, the heat of his body had risen from 102° to 109°, the venous blood had assumed so much the hue of arterial, that it was difficult to distinguish between them; and this was confirmed, in repeated experiments. It has also been verified by de la Roche. Hence, it appears, that the high temperature counteracts those chemical changes which the blood undergoes in the extreme vessels, and the diminution in the consumption of oxygen, is influenced by the food and the state of digestion. During digestion, the consumption of oxygen was increased to 1800 or 1900 cubic inches in an hour. Exercise increased the proportion consumed. It is stated, that Seguin, in continuing the exercise of raising a weight of 15 lbs. to a height of 613 feet, during a quarter of an hour, consumed 800 cubic inches; which is at the rate of 3200 in an hour. And the same exercise, made during digestion, occasioned a consumption equal to 4600."

XCVII. Animals, it is reasonable to suppose, disengage only the caloric combined with the portion of air which they may employ in the function of breathing. It is not an allowable conclusion, that animals are in possession of the faculty of physically or materially generating caloric, and thus, *per se*, extricating and rendering this powerful principle sensible. The proportion requisite to their welfare, is disentangled, only from that part of the atmosphere appropriated in respiration. The superfluous quantity, how much soever this may be—but which, as formerly supposed, must be extensive—is regularly and continually dissipated, and again communicated to the atmosphere; and thus once more loses its sensible properties, unless the air to which it is transmitted, be in a state of confinement. The incorporation and disengagement of caloric, is an operation constantly proceeding, both in the animate and inanimate parts of the universe. Sometimes it is sensible to common perception, but, also, frequently subsists in the condition of "latent caloric," or that which is not discoverable by animal perception, nor determinable by thermometrical admeasurement. Possessing substantial or material, although extremely subtile properties, however, it can never justly be considered as in a condition absolutely privative. The consideration and examination of respiration and perspiration, in all their circumstances, as intimately conjoined in functionary performance and sympathy—the particular properties of each, and how they may be affected by the variableness of temperature, &c.—would far exceed the prescribed boundaries of these desultory observations. Regarding inquiries proposed for these ends, it would be adviseable for philosophers to make observations upon the hitherto undescribed power of temperature, in regulating and maintaining these vital and necessary processes in the constitution. The preceding observations suggest the probability, that the calefaction and frigeration of animals, have, and bear to each other, an unalienable, or nearly immutable reciprocation; or, in plainer language, the cooling possesses an invariable proportion and exactness, other matters equal, to the heating operation, as long as the system is not affected by any particular indisposition.

XCVIII. As it has already been said, the different degrees of temperature in which animals live, and maintain, with wonderful correctness, an equipoise of systematic calorific distribution, are almost innumerable; so a proposition arises, how this unexpected circumstance is to be understood, or how is it explicable? Does the animal breathing air at 84°, for example, extricate a smaller, but dissipate a larger quantity of caloric, than an other animal respiring air, when cooled down to 32°, &c. of Fahrenheit's thermometer? The difference of the temperature of a healthy vigorous man, and that of the air at 84°, will be about 16°; while that of the person breathing it at 32°, is about 68° of the same instrument. The absolute difference of the demonstrable temperature of the air, used by each, is 52°: and this, certainly, appears a disproportion of very considerable amplitude and importance. What conclusion is to be drawn, relatively, to the augmentation and requisition of the air at 32°, or under, to the animal temperature? This alteration, too, it is probable, almost instantly ensues; otherways, the cold air would be productive of more unpleasant perceptions, and prejudicial consequences, upon the structure subservient to respiration. Is it a reasonable supposition, that the person breathing the coldest air, does not disseminate such an extensive proportion of temperature into the surrounding atmosphere? And does this supposed diminution correspond with the portion of caloric requisite to raise the air from 32° to 100°; the former the coldest air assumed to be respired, and the latter the height of animal temperature? For the illustration of these propositions, it is, perhaps, not necessary to determine, whether this increment may originate from latent caloric unfolded, or be disembodied by the decomposition of the atmosphere in respiration, and constitutional appropriation of part of the caloric then disentangled. The determination of these questions, with others which might be proposed, would materially contribute to elucidate the operation of caloric upon the human constitution. And, as a conclusive observation on this point, it may be noted, that, if this almost constant æquilibrium of temperature did not predominate, *cæteris faventibus,* notwithstanding all atmospheric mutabilities; animal nature would be frequently almost immediately extinguished, and would thus be introduced only to be forthwith exterminated.

XCIX. The following remarks are made by a modern chemist, of undoubted excellence in this department of natural knowledge. " In respiration, the air suffers changes, which we know, in all other cases, are accompanied with an evolution of caloric; and the theory of Crawford shows how these gave rise to the phenomena of animal heat: we have the additional evidence, that the superior temperature of animals, is proportional to the quantity of oxygen they consume in respiration, and that the heat evolved by an animal, is almost precisely the same as that evolved by the consumption of the same quantity of oxygen, in other cases, where carbonic acid is formed. With such proofs, we can scarcely hesitate in admitting the conclusion, conformable to this theory—that the chemical changes which occur in respiration, with the corresponding changes in the extreme vessels, are the source of animal temperature." —The following observation is suggested by Dr. A. P. W. Philip: "The experiments related in the last chapter, (chap. vii. on the Vital Functions, &c.) compared with those on secreting surfaces, seem to me to prove, that the caloric, which supports animal temperature, is evolved by the same means—namely, the action of the nervous influence on the blood; by which the formation of the secreted fluids is effected, and, consequently, that it is to be regarded as a secretion. If this view of the subject be correct, and galvanism be capable of performing the functions of the nervous influence, it ought to occasion an evolution of caloric, as it effects the formation of secreted fluids, from arterial blood, after the nervous influence is withdrawn," &c.—"When an animal is placed in a medium, the temperature of which is considerably high, it still preserves its temperature, for a time, at least, nearly uniform; the animal heat not rising much above the natural standard,—as has been demonstrated by the experiments of Tillet, and of Fordyce and Blagden. ...In this case of confinement in a heated atmosphere, it has been ascertained, by the experiments of Crawford, that the usual change of arterial into venous blood, does not go on; the blood in the veins being nearly as florid as that in the arteries. It is evident, therefore, that no evolution of caloric will take place; and it is even possible, that the temperature of the body may be kept low, by the blood acquiring an increased capacity for caloric; though other circumstances—particularly the imperfect conducting power of the animal solids, and the increased perspiration, with the evaporation from the surface—have a share in the effect. Dr. de la Roche has, in particular, shown, that the loss of weight from the profuse perspiration is very considerable, even in not many minutes; and has found reason to conclude, from experiment, that the consequent evaporation is the cause counteracting increase of heat."—These quotations seem to strengthen some of the Author's opinions, in these disquisitions, which were composed without any relation to, or assistance from, these authorities. It would appear, from the experiments of Dr. Crawford and others, that animals disengage a less quantity of caloric, in an elevated than in a depressed temperature.

c. Some of these observations constitute a short explanation of the manner in which redundant, and, therefore, injurious temperature of animals, in many situations, conditions, and regions of the earth, is commonly expended. A laboured discussion of this subject, with diffusive physiological disquisitions, chemical and mechanical illustrations, &c. would be far too extensive; the outlines only have been given, and particular inquirers may easily extend the boundaries of these investigations. When the atmosphere is commoved, the absorption and removal of superfluous animal temperature, are then more pleasantly and powerfully accomplished. This is often remarkably exemplified in, and gratefully experienced by, those who have previously been exposed to its embroiling augmentation. The inhabitants of northern climates, therefore, dispose of their exceeding heat, generally in a less disagreeable and inoffensive manner than those of the tropical. Residents, indeed, of these latter countries, generally speaking, have their perpetual uniformity of temperature regulated and maintained by the quantity of moisture, evaporated from the surface. This circumstance, however, is not so conspicuous amongst the natives of these climates, as in those who are lately their adventitious, and thereupon, previously unaccustomed, inhabitants. A quantity, probably often variable, of caloric, is constantly abstracted from the corporeal surface; and this, in tropical latitudes, is regulated principally by the proportion and absolute sum, or amount, of evaporation. This is sometimes beautifully illustrated by the coolness of a perspiring, and the comparative warmness of a part of the surface which is not discharging any sensible exhalation. This phænomenon is occasionally observeable in the same individual; and, in this condition of matters, his feelings are, almost unexceptionably, disagreeable. The cuticular action being irregular, he has also now and then unequal sensations of chilliness and warmness. The exhalation from the skin, and diminution of temperature, frequently unite in maintaining this constitutional equability of temperature. This combination often forms one of the most acceptable concomitants of moderate employment, or bodily exercise; and is oftentimes beneficially corroborative of distempered and enfeebled constitutions. These contrivances for establishing and constantly supporting an equipoise of temperature, operate either separately or conjugately, in conformity to the nature and other qualities of the foregoing particularised circumstances. Amongst the inhabitants of the warmer climates, as lately stated, this advantage is principally attributable to the evaporation of the cutaneous moisture. In these countries, for the most part, an abundant perspiration, and consequent exhalation, are continually observeable. This perpetual waste must be counteracted by the proportionate ingurgitation of aqueous liquids; for, if diluting fluids were withheld, febrile commotion, with all its irksome symptoms, such as dryness and unpleasant warmness on the surface, and a generally diffused perception of uneasiness, restlessness, &c. would speedily be the consequence. The needfulness of swallowing sufficiently countervailing quantities of liquids, is, in these territories, particularly exemplified.

CI. Animals produced in torrid climes, more speedily attain the height of their growth; but a misfortune in opposition to this advantage, is the comparative infrequency of their longevity. Some of the forementioned circumstances may contribute to the production of this seemingly unavoidable imperfection. A natural and ingenite condition, may, however, facilitate the endurance, and certainly moderates the actual amount of their influence. From a primitive and connatural disposition, gradually and generally strengthened and established, an unperceived, but preservative compliance, with unavoidable circumstances, at last obtains invincible confirmation. The natural severities of different climates, from continuance of exposure to their otherways hurtful operation, thus happily become more conveniently supportable. Notwithstanding these applicable conclusions, however, the natives of the colder regions are only qualified and enabled, by degrees, to withstand the operation of augmented temperature, with all its incommodious circumstances. The inhabitants of equatorial, and other intemperate latitudes, are, therefore, under the necessity of employing a larger quantity of watery fluids, succulent fruitage, and other vegetable substances. This practice appears to be suggested by physical propriety and necessity, as well calculated for the preservation of healthiness, and the preparation of the constitution for the endurance of the unfavourable circumstances, which, in these regions, are so constantly prevailing. The absolute quantity of liquids, required in any climate, *cæteris paribus*, it may be remarked, is commonly regulated by that exhaling from the surface.

CII. A circumstance, of very considerable importance, has been observed, not only in the warmer, but in the temperate latitudes; which is, that the application of cool liquids to the surface, commonly alleviates the craving and distress of thirst; or, if this superficial lavation or sprinkling, &c. be copiously and constantly used, will, for sometime, supersede the necessity of drinking. Immersion in watery liquids has, likeways, produced this agreeable consequence. From these occurrences and observations, a satisfactory explanation of the pleasant operation of the falling of gentle moisture, in tropical climates, is attainable. All the languishing and distressing sensations, so frequently originating from the influence of conquering heat, and likeways that of thirst, are sometimes almost immediately mitigated or removed. And thus, the application of moisture to the surface, as by the falling of a gentle shower, has produced, in passing through tropical countries, grateful and refreshing effects. Sprinkling or immersion have, upon some particular and unpleasant occasions, been used to abate thirst; and thus mitigate or preclude the necessity of drinking. This acceptable consequence has been obtained, equally, whether the bathing, &c. were practised in salt or fresh water. A sudden reduction of temperature, and more especially when the atmosphere was charged with moistness, has been frequently productive of a similar advantage.

CIII. The explication of the mode in which this advantage is obtained, appears, at first sight, extremely difficult. The absorption of watery liquids by the cuticular surface, is at best doubtful, and by many is supposed never to happen. The speediness of the consequences deriveable from bathing, immersion, &c. would, in some measure, seem to contradict the probability of the occurrence of absorption. Different experiments have been instituted, with the view of ascertaining whether absorption does take place or not; and this was done chiefly by determining, whether any augmentation of heaviness was observeable, from the application of the fluid to the surface, and thus become indirectly declarative of absorption. The most intelligent and philosophic, who have undertaken these examinations, refuse assent to the confirmation of this occurrence. , It is not, therefore, indubitably determined, whether water is generally absorbed by the common surface, but rather the contrary. That other substances may, however, be conveyed into the human system by cutaneous absorption, has been long acknowledged, and irrefragably demonstrated, by the superinduced consequences. Absorption, it is observeable, can only be regularly accomplished by animated and peculiarly contrived structure. Percolation, transmission, &c. of liquids, may take place, through inanimate or inorganic substances; but this must be very dissimilar to absorption by contexture, under the influence of animated governance. The simple imposition of a fluid, upon the surface, is, for the most part, not sufficient for the production of absorption. The most probable explanation of the advantages induced by the application of fluids to the surface, is the action of evaporation, a substituted intervention, fulfilling the purposes of perspiration. The removal of the cuticle, or epidermis, appears to dispose to the readiness of absorption. Absorption in the live body, must always be actively, never passively, permitted and performed. The transmission of any substance, from the surface into the constitution, without the aid of regulating and determinate animal activity, is a proposition, or hypothesis, inconceivable. For the introduction of substances at the surface, friction, or some other stimulating application, is ordinarily necessary.

CIV. While the person continues immersed, or even when the surface is continually moistened,—and, more especially, if the liquid is considerably under his own temperature,—it is reasonable to suppose, that his superficial transpiration is considerably diminished, or rather, for the time, wholly interrupted. There is now, therefore, no exhausting dissipation of the corporeal fluids, excepting the natural halitus from the bronchia; part of which, at least, is probably the aerial moisture, somewhat condensed, in a state of evolution, from the portion employed in respiration. The æquilibrium of the circulation, is universally and favourably supported, and there is no immediate or important reducement of its absolute proportion. The fluid in which the person is plunged, or with which he may be moistened, is constantly absorbing and transmitting from his surface the unnecessary and unemployed temperature. If he has only wetted his skin, evaporation, as already mentioned, becomes the mode of operation of the transferring intermedium. Phænomena, of somewhat different description, are observeable, if the person is immersed in water above his own temperature. This, indeed, is sometimes one of the most effectual contrivances for inducing a disposition to perspiration. And, moreover, it deserves notice, that if the heat of the bath much exceeds that of the person, it frequently becomes very unpleasant, or even distressing; and sometimes productive of dangerous consequences. This is one reason why all liquids of apparently the same temperature, as determinable by the thermometer, with that of the atmosphere, impart a sensation of higher warmth. They do not so conveniently and immediately remove the heat evolved by a living process; and thus, the animal heat may become unduly accumulated; and it seems also very probable, that heat may thus be artificially communicated. The Sirocco and Harmattan, as they are denominated, perhaps excite their mischievous effects by causing instantaneous evaporation from the surface, with immediately supervening constriction thereupon, and the caloric becomes aggregated or concentrated; and hence the accompanying superficial poignant sensations, and also of the more generally diffused feelings of uneasiness.

CV. Atmospheric temperature of 212°, or still more, of even 300°, as already observed, is transitorily but grievously supportable. The same degree of heat in water, or any other liquefiable, but customarily solid substance, would be almost immediately destructive. In the atmospheric augmentation of temperature, the evaporation of perspiration, and consequently its refrigerating power, is allowed to have its full effect in modifying and assisting the temporary preservation of the animal in exposure. Again, in water, from its denseness, at a parity of temperature, as decided by instrumental measurement, the transference of the caloric which should be disengaged by the animal, is liable to insurmountable inconvenience and interruption; and, also, the superaddition of that communicable from the water, quickly produce such a disproportionate and insupportable accumulation, as to become, by the living body, altogether irresistible. The impediment to the superficial disengagement of animal temperature, and the unnatural communication of heat to a body containing, comparatively, a diminutive proportion, are thus collectively operative in the production of these circumstances.

CVI. The attainment of the beneficial consequences of bathing, &c. applied for the purpose of lessening thirst, and obviating the necessity of drinking, will be determinable by the relative temperature of the intermedium. If the augmentation of the temperature of the superficial application be excessive, the effects, instead of being advantageous, will be prejudicial. Immersion, or bathing in water of a moderate temperature, therefore, will commonly be most adviseable; and, in this way, any benefit to be expected will be easily obtained, and the chance of any inconvenience thereby precluded. If a powerful and immediate effect is desireable, then a diminution of temperature will more quickly answer the purpose. It is observeable from the disastrous mischances of those who have suffered shipwreck, and been subsequently, for some time, more or less immersed in the briny waters, that thirst is not often one of their painful feelings. This circumstance is illustrated, but imperfectly explained, by the observations previously introduced. The satisfactory elucidation of all these things would become so extensive, as to be here inconsistent. From unhappy experiment, however, it has been ascertained, that those who have been partially and occasionally wholly immersed in salt water, have not been, amidst all their other sufferings, much afflicted with thirst. But, whether the observation be so applicable to disasters of this kind, happening in high temperature, is, perhaps, not determined. If the greatest part of the body is exposed, it is probable that thirst may be one of the troublesome circumstances. It is mentioned of the small island Geruna, or Gerun, lying in the Persian Gulph, in about 27° N. that "The heat is intolerable: in summer, the inhabitants lie plunged in water for many hours: in winter, they sleep on the terraces of their houses." It is also further said of this barren spot, that "There is no spring or water but such as is saved from rain, and rain falls seldom; no plant or vegetable, but a few at the king's palace set in earth, brought from the continent, &c." The immersion in water mentioned, (which must arise from natural instinct, the same as applicable to the brutes in the heat of summer,) will answer the purposes of superficial transpiration:

and this may serve as an illustration and corroboration of some of the forementioned disquisitions.

CVII. A few remarks on the probable manner in which the bathing operates, may here, however, be suggested. In the extraordinary augmentation of temperature, the effects of keeping the surface moistened, appear to be either not understood, or are unexplained. How does it produce its pleasant, and, occasionally, beneficial consequences? The most natural, and, probably, the most correct notion, is, that it is serviceable by acting as a substitute for perspiration; and that, by this means, the accustomed exhalation from the surface will be considerably diminished, or it may be completely suspended, continuing its application. While this state of circumstances lasts, the urinary secretion, which was before lessened, is now more copiously separated; but, perhaps, not so extensively as to countervail the suppresion of perspiration. The adventitious moistness of the surface, is considered as equivalent to the formerly necessary quantity of humour emanating from the cutaneous spiracula; and, therefore, vicariously furnishes correspondent advantages. For the fulfilment and continuance of this substituted operation, the frequent repetition of bathing, or continued immersion, seems to be requisite. The general quantity of the cutaneous discharge is thus diminished, and likeways that of the superficial circulation; and, consequently, that of the internal vascular congeries is relatively augmented. The comparative proportion of the fluids of the body, heretofore dissipated by perspiration, is now considerably lessened, or, for a time suspended; and, therefore, the demand for liquids materially reduced, or altogether removed.

CVIII. These appear to be the general principles upon which moistening the surface may reasonably be supposed to operate. In the warmer climates, if the general surface could be constantly preserved in a moistened condition, the body might be exposed to almost any degree of atmospheric temperature, with comparative little inconvenience. These conclusions are not so applicable to the natives of tropical climates, —for these latter are generally exposed without any precaution of this description, with apparent impunity,—as it is to the natives of northern latitudes, when translated to the former countries. Captain Bligh, in his passage from the Friendly, or Fejee Islands, to Timor, in an open boat, with his fellow voyagers, were exposed to high temperature, (the principal part of their course, extending to at least 3000 miles, lying betwixt 8° and 16° S. latitude,) and the disheartening inconveniencies arising from an inadequate supply of water. He, however, with philosophic and advantageous determination, employed the method which has been shortly explained, by sprinkling, immersing, &c. with the briny fluid with which they were surrounded. In their perilous and forsaken situation, his judicious and admirable adaptation of fortuitous necessity, to the mitigation of their sufferings and the preservation of their lives, stands as an example for those who may unhappily be plunged into such disagreeable circumstances.—These remarks are more especially applicable to the natives of the milder climates, when they are unluckily exposed in exacerbated temperature. The natives of the tropical climates, as occasionally explained, do not naturally require such nice precautions.

CIX. And, in this manner, it is extremely probable, that the greatest benefit might be obtained from judicious attention to this subject. In the oriental countries, in which European soldiers, and others, are so frequently in unfavourable exposure, and the former necessitated to undergo laborious exercises, fatiguing marchings, &c. under the full influence of scorching and distressing heat,—the most watchful precaution becomes required for the prevention, and, at all events, most certainly for the mitigation of their miserable, and, too often, unpitied sufferings; and protection from otherways prejudicial consequences. Some of the most vigorous and powerful, speedily become lamentable sacrifices to the unfriendly influence of their exposure. The injury thus sustained, may determine the fate, or upshot, of an intended conflict or enterprise. The congregated efficiency of vigorous people, is duly calculated and appretiated only by the considerate and experienced. If the head and shoulders were properly surrounded with light clothes, constantly maintained in a state of humectation, they would thus, most probably, be enabled to withstand these unfavourable circumstances. Nevertheless, prudence would be necessary for its advantageous management; but this, generally speaking, is not, in these climates, a subject of such remarkable importance. The avoidance of such an application may be commendable when perspiration is considerable, and universally disseminated over the surface; and, more particularly, if debilitation is superinduced. While the perspiration flows copiously, the superficial temperature seldom surpasses the customary healthy standard; more commonly to the feelings of another, it is in a state of repression, and communicates or excites in him the notion of coolness.

CX. When the external heat is, perhaps, somewhat augmented, without much perspiration, &c. then will be the proper time for the refrigerating application. To the head, &c. it may be applied, properly and usefully, in any situation, if headache, thumping in the temples, or a sensation of fulness or distension within the head, indicate the propriety of its administration. It appears unnecessary to enumerate every particular circumstance which may recommend or disapprove its application. The knowledge of all these should be intimately and distinctly impressed upon the remembrance of every practitioner, attempting to undertake the guidance and medicinal assistance of his fellow creatures, in the foresaid situations. If perspiration has been protracted, and the person become fatigued or languid, and the action of the circulation much enfeebled or irregular, its employment, excepting in some instances, and with judiciously regulated adaptation, might be extremely injurious. This remedy is more commendable, while the constitutional capability, or susceptibility, is considerable and unfoiled; to this, however, there are exceptions, when tepid water may be usefully applied; but the management of which cases must be under the judgment and ingenuity of the discriminating and intelligent practitioner. From its application during exercise, &c. the fullest benefits naturally to be obtained, are thus agreeably experienced. The person exposed may thus strengthen and maintain, for a longer time, both his durability and promptitude for continuing and performing his undertakings. This application, opportunely commenced, may be continued and regularly performed, with more comparative advantage, until it may introduce the appearance of approaching inconvenience, which, in a healthy system, with the specified cautions, &c. will seldom be observeable.

CXI. A proposition, comprising some difficulty in its satisfactory determination, is, whether in tropical latitudes, an uncommon proportion of dampness in the atmosphere be occasionally productive of any conceiveable or ascertainable inconvenience? or, contrarily, if a considerable reducement of the quantity of aqueous vapour, naturally and commonly contained in the air, be the cause of any particular indisposition? That an unnatural dryness of the atmosphere may be the cause of many mischievous consequences, is, from a multitude of circumstances, almost susceptible of demonstration. But extreme dryness of the air is, at least, such an extraordinary occurrence, that it appears unnecessary to take this state of it into consideration, in the prophylactic administration. Atmospheric dampness, particularly when not accompanied with any remarkable depression of temperature, does not seem to cause any immediately perceptible inconvenience. It may frequently act as a serviceable subordinate of perspiration. Dampness, especially when accompanied with diminution of temperature, is, ordinarily, a more prejudicial circumstance. This is continually exemplified in all the changeable latitudes, in which this state of things is more generally observeable. This atmospheric qualification is greatly affected in its peculiar influence, by the particularities of constitution, habiliments, exposure, &c. and the concomitant proportion of temperature. Some people have the greatest health, when the air contains the largest quantity of moisture. Others, however, enjoy the best health in the driest state of the atmosphere. Some, again, obstinately indifferent to all matters of ordinary occurrence, appear to think it a matter of little moment; and are seemingly unaffected by these vicissitudes, as long as they remain within a moderate circumscription. No regulation, therefore, continually applicable to every individual, can possibly be suggested and recommended. But it should be remembered, that atmospheric dampness, in company with diminution of temperature, is to all, nearly unexceptionably, sooner or later the most unpleasant and detrimental.

CXII. The natives of colder regions, when carried into those which are warmer, should be gradually and cautiously exposed. The influence of custom, and especially when passed into habit, in regulating and moderating the tolerance or endurance; and thus, in lessening the force of the impression of surrounding circumstances, is truly admirable and extensive; and has been, in all ages, one of nature's most advantageous preservatives. Precautions of proportionate importance, but of a dissimilar application, are requisite, when the natives of the warmer are exchanged to the colder climates of the earth. They should, therefore, be provided and fortified against the unfriendly impulses of the more distant southern or northern latitudes. This subject, however, will be more largely discussed, when clothing, &c. are under consideration.—These conclusions are not only applicable to human beings, but even to irrational creatures, when translated from the warmer to the colder climates. This is exemplified in the attempts of those who endeavour to bring home some of the more delicate of the winged tribes; and, likeways, of the family of the monkeys, which are subject to disease and destruction. The influence of diminished temperature is frequently and peculiarly illustrated, in the natives of the warmer, when carried into the colder countries. In this manner, many of them have been cut off by scrophulous complaints, in all their disagreeable consequences; pulmonary consumption, &c.

CXIII. European seamen, and others, when conveyed into the warmer climates, are frequently exposed to the alternations of powerful insolation—the terrene wind and marine breeze. In particular harbours, these inconstant differences of diurnal and nocturnal temperature are more especially observeable. Harbours which are subject to the modifying influence of mountains, or extensive woodlands or marishes, are more particularly obnoxious to these circumstances. And, it may be remarked, that in these places, the difference of the daily and nightly heat is very considerable and important to those in unavoidable exposure. "Cœlum sub quo degunt homines nonnunquam ægros facit." "Unicuique nimirùm regioni suum inest vitium; sive calidior justo sive frigidior fuerit, sive varia, multisque et subitis tempestatis mutationibus obnoxia." As may be collected from different observations in the course of this work, the greater the difference betwixt the nocturnal and diurnal temperature, (and especially betwixt the extremes,) so much the more considerable will their impression be upon those in exposition. Sailors are often singularly improvident and inattentive; for, even after the labours and fatigues of a broiling day, they will carelessly recline themselves in situations where the coolness or dampness, &c. of the night must infallibly assail them; and thus procure to themselves many varieties and degrees of inconvenience.

CXIV. People who have been produced and resided in northern climates, possess, apparently, a degree of strength and firmness of conformation, superior to those who have been generated and remained in the tropical. The inhabitants of northern countries are generally subsisting in a moderate, and frequently in an extensively diminished temperature. The inhabitants of torrid climes are exposed, most commonly, to what may be considered a relatively vertical solar influence, and a quantity of reflected caloric; the collected operation of which must be greatly aggravated. The natives of these regions, it is probable, will, from continual exposure, (and, consequently, acquisitive state of constitution or temperament,) to these otherways injurious but unavoidable occurrences, sustain much less mischief than the adventives from climates oppositely conditioned. Dewar, in his Sketch of the Medical History of the Campaign in Egypt, &c. remarks: "Hot countries cannot be considered, in general, as more unfavourable to the population of the human race, or the vigour of the constitution, than the cold and temperate. Egypt is as well peopled, in proportion to the state of its industry and resources, as most other countries. The Mamelukes are addicted to luxury; but their bodies are robust, and capable of wonderful feats of strength, and their minds are warlike and undaunted. The Felahs, or peasantry, are rendered a cowardly race, from being habitually subjected to the yoke of military despotism, and from their habits of industry being repugnant to the cultivation of the art of war; but their constitutions are hardy. Under a burning sun, and with their heads uncovered, they perform very long journeys, and carry incredible burdens, without complaining of fatigue. The Bedouins, or inhabitants of the neighbouring deserts, are also a hardy race, capable of undergoing great privations, and persevering in vigorous exertions, and are the farthest possible removed from any thing like a state of luxury or effeminacy. The enervating influence of the climate, therefore, is with respect to the natives a mere chimera."

CXV. Apply now, therefore, the General Doctrine to practical purposes. Observe seamen in any of the foresaid situations, actively and severely employed during the day, and perhaps exposed in a temperature of 80° to 90°, or even sometimes a more uncomfortable augmentation. The cutaneous perspiration is then copiously discharging; the cuticular spiramina are patulous or expanded; and, in these circumstances, frequently uncommon quantities of liquids are unguardedly or incautiously swallowed. The frequency of arterial pulsations, from the combined influence of corporeal exertion, and the stimulation of heat unduly operating, is generally augmented, sometimes in their firmness, fulness or quickness; often, however, their healthful and regulating properties are impaired, proportionally to their acceleration or frequency of repetition, and the whole system becomes more delicately poised in all its reciprocal and sympathetic dependencies. Affairs being in this critical state of libration, the vespertine coolness is at last in a state of forwardness; and the marine is exchanged for the chilling and variously, sometimes noxiously, qualified land-breeze. And these are circumstances frequently affecting some of the thoughtless and inconsiderate of mankind.

CXVI. The previously augmented temperature is sometimes suddenly and materially diminished. This depression will occasionally be even 10°, 15°, 20° or 25°, in the course of an evening. In particular situations, these remarkable alternations are sometimes introduced, without any apparent and immediate reference to the conditional circumstances of naturally successive, and necessarily concatenated diurnal and nocturnal revolutions. These fluctuations are very perceptibly displayed near mountainous coasts, or anchorages, which are influenced by the particularities of the neighbourhood. And this sudden diminution of temperature is well illustrated in the Chinese Whampoo anchorage; and which ordinarily commences in the daytime, with a cooling breeze proceeding from a northern, or north-eastern quarter; and commonly rather proximately to, at least, (as far as observation has extended,) not distantly from plenilunar recurrence; and thus for some time periodical. This description is more particularly applicable to the winter months of the southern confines of that country. The imprudent, and consequently unguarded sailor, often experiences mischief and detriment from these incommoding atmospheric fluctuations. These unfavourable circumstances not uncommonly seem to be the causes of the developement, or aggravation, or recrudescence of intermittents. And these prejudicial consequences are often proportionate to the highness of the temperature which has been immediately antecedent. The reason or cause of this, is deducible and colligible from two considerations. It appears from observation and experience, to be sufficiently demonstrated, that the human body is more susceptible of troublesome and mischievous impressions from a reducement of temperature—which has been previously at 90°, or even 80°, to the extent of 10°—than an equal descent from 70° to 60°, for instance; or from the latter to 50° of the thermometer. And, moreover, another cause is—the unprepared state of the person who may be obnoxious to this unexpected, perhaps, but important diminution. The pathology of the constitutional changes, and explanation of the phænomena, may be immediately understood from the forerunning observations, and some which may be afterwards introduced.

CXVII. The thoughtless and unpolished sailor too often encounters these occurrences, without the intervention of any suitable or adequate precaution. He, often seemingly with obdurate stiffness and regardless indifference, tolerates even the circumstances which are to be the fruitfully productive causes, in all probability, of unpleasant, irksome, or, perhaps, irremediable complaint. The person, forsooth, who is seriously indisposed, or who is a convalescent from some illness, with an intolerable share of perversity, often, negligently, by irregular and indiscreet exposure, or some other undiscovered mismanagement; or, as frequently happens, from a deficiency of appareling, is again plunged into a state of aggravated indisposition. Inattentive and disobedient to the expostulations of friendship, even those who may be in possession of moderate health often repose themselves upon deck in the evening, or during the night, and are thus exposed to the influence of vapours and other pernicious substances, which may be conveyed in, and by the land-breeze, and now precipitated in the state of condensation. As lately remarked, these things are, in particular harbours, &c. accompanied with coolness of the atmosphere; and what contributes powerfully to the effects of these unfavourable circumstances, is the moisture descending and condensing in the evenings; and, *cæteris paribus*, the hotter the day preceding, this appears in a larger quantity. The avoidance or shunning the merciless and painful ravages of musquittoes, and also of unpleasant and frequently distressful heat, and oppressive closeness, &c. are generally propounded as arguments for this careless exposure. When deemed adviseable or beneficial, therefore, from the peculiarities of the harbour, or anchorage, or uncertain weather, or the unwholesome properties of the neighbourhood, to restrain this irregular exposure, &c.—if temperate admonition will not suffice, then official prohibition must interfere.

CXVIII. In particular anchorages, and especially where ships are affected with the influent and refluent tides, (which commonly happens in rivers which are acted on by the sea, and in the generality of harbours,) they are swung different ways four times every twenty-four hours. In this manner, if a ship is anchored near shore, she may be so placed as to have a weather, or windward, and leeward side, every six hours alternately. In cold weather, therefore, or when the vessel is casually obnoxious to a land-breeze—and, as this happens chiefly in the night-time, if it is fitted with ports, these should be closed for the sake of defence. The people upon the leeward side, for instance, may go to repose with some degree of comfort, unless they should be exposed to the stinging of insects, or the action of burdensome temperature: but, upon the turning of the vessel, they may be disturbed by the coolness of the breeze; and, if they have been lying thinly, or, perhaps, nearly altogether uncovered, as frequently happens in the warmer seasons, or in the sultry climates, they are often roused by painful sensations in different parts of the body; or, as not uncommonly happens, some complaint is thus produced. In all situations, therefore, where ships may be changed in their bearings with regard to the vicinity and the influence of the elements, care should be taken that the sides which might happen to be exposed to the breeze, and particularly in the night season, be made adequately defensive. From affectation of formality, in having the port-holes unclosed, guns run out, &c. much mischief has been committed amongst the health of the seafaring. "In line of battle ships, the ports being up and the guns run out, has a fine appearance: but, in this case, the health of the crew should be consulted; for in cold damp weather, and particularly when the ship is broadside to the wind, the exposing of the men to a current of air upon such occasions, and when too they are in an inactive state, is extremely detrimental to their health, and brings on a train of dismal disorders. At these times the weather ports should be shut. A frame to fit every port, with double bunting stitched to it, is an excellent mode to correct the evil consequences of too great a current of air passing through the ship at improper seasons. It prevents the ill effects of too much air, but admits enough for sufficient ventilation."—These are the observations of one, who had much experience in matters connected with seamen; and, in an especial manner, with their complaints; and may serve as additional illustration and confirmation.

CXIX. Some of the more immediate and remarkable consequences of this imprudent exposure to diminished temperature, with its multifarious circumstances, are repulsion (as it is virtually and vulgarly expressed); but more consistently and correctly speaking—interruption or obstruction of perspiration, constriction of the cuticular emunctories, and a diminished proportion of superficial circulation. The more internal and capacious vessels, which lately contained and conducted a lessened quantity, are now obliged to receive and convey an increased proportion. In a healthful and accurately balanced system, this alteration of the distribution of the sanguinis circuitus, may not induce any immediate or particular inconvenience or disadvantage; but, if any of the viscera be affected with disorder of its structure or functions, the state of things becomes materially different. When chronical inflammation, for example, is, perhaps, privately operating in the hepar, this important alteration in the swing of the circulation is especially injurious. In the affected organ, there are introduced the disquieting feelings of heaviness, uneasiness, tenseness, &c. (and which are sometimes accompanied with irregularly perceptible fits of chilliness, &c.) which are often felt through the neighbourhood, or even in distant parts, with sympathetic communication; and the true seat of which evils is too often unsuspected, or the actual condition of matters not understood, or, unhappily, at the time overlooked. Headache also, and sometimes a proclivity to the premonitory symptoms of apoplexy, hemiplegia, or paralysis of a particular member, &c. are occasionally introduced. Swellings of the inferior extremities, more diffusedly or confinedly observeable; stiffness of the articulations; irregular and spasmodic affections of the muscles, by which their accustomed movements are rendered awkward and dissevered from their requisite steadiness, are sometimes superinduced. Sensations of tightness in the thorax and abdomen, inflated and misshapen features, aqueous distension of the superficial cellular congeries, &c. are a few of these anomalous consequences. Commanders, and all officially commissioned for the guidance, management, and protective administration of seamen, should be peculiarly circumspect of all these vicissitudes of atmospheric temperature, and the primitive symptoms of distempers unfolding themselves, continuing the prevalence of these circumstances.

CXX. The people who are sent on shore for necessary purposes, are likeways often exposed to the influence of hurtful alternations; and also to the variegated effluvia emanating from the earth's surface; to the paludum miasmata, &c.: these latter are particularly prejudicial to the constitutions of those previously unaccustomed. The complaints which, subsequently, are commonly the most formidable, are febrile ailments, having some dissimilitude of appearance, but ordinarily exhibiting the semblance of irregular and intermitting character. When men, not accustomed to a situation of a dangerous description, are obliged to remain on shore during night, they should, if in the vicinity of swampy ground, assume, when possible, a station to windward of the unhealthy place; and likeways, when necessary, to be secluded from the operation of the weather. In situations thus naturally qualified, the powerful assistance of custom, when confirmed into habitude, should generally be included in calculations concerning people destined for these purposes. Those who have been formerly familiarised with exposure to these circumstances, will often withstand, with apparent impunity, their operations; which, without this superinduced constitutional qualification, would, to them, infallibly prove detrimental. The unseasoned, (venia sit verbo,) again, if improperly employed upon these occasions, partly from the impression of noxious powers with which they are inexperienced, and partly from their own inattention and irregularity, &c. will generally be liable to less or more mischief.

CXXI. The following notices may be introduced from Dr. Lind's book, which has been already mentioned: " Now, since it is so dangerous for Europeans in unhealthy countries, particularly during a season of sickness, to be exposed in an open boat to the foggy night air; it must appear, that sending them unsheltered, in open boats far up rivers, in unhealthy southern climates, for the sake of wood, water, trade, or other purposes, must be attended with the most destructive consequences.—The best preservative against the mischievous impressions of a putrid fog, or of a marshy exhalation, is a close, sheltered, and covered place; such as the lower apartments in a ship, or a house in which there are no doors or windows facing the swamps. If in such places a fire be kept, either in the chambers, or at the doors and other inlets to a house, as is practised in some unhealthy countries, during their rainy or noisome foggy season, it will prove an excellent and effectual protection against the injuries of a bad air: on board of ships, fires may be made at the hatchways. Of many examples which might be offered to prove this, I shall only give one. When the Edgar, a ship of war of 60 guns, was upon the coast of Guinea, in the year 1765, her men were very sickly, and many of them died; whereas it was observed, that in a sloop of war, which was constantly in company with her, few were taken ill, and not one died during the whole voyage. This could be ascribed to no other cause, but that in the sloop the fire-place for cooking victuals was on the same level with the deck upon which the men lay; and every morning when the fire was lighted, especially when there was but little wind, the smoke from the cook-room spread itself over the ship, particularly over those parts where the men lay; but from the construction of the fire-place in the Edgar, no smoke from it ever came between her decks.

CXXII. " Persons on board any ship whatever," Dr. Lind continues, " are much safer than those who make distant inland incursions, in small boats upon the rivers, in unhealthy tropical countries. These are also, for the most part, totally ignorant of the sources of the diseases and deaths which surround them. The intolerable scorching heat at noon often obliges such persons to go half naked, their clothing being almost insupportable; while a free and plentiful perspiration issues from every pore. In the daytime, the swampy shores emit a smell resembling that of putrid carrion; and a near approach to such putrid swamps, is then apt to produce an immediate sickness, a vomiting, and afterwards a low nervous fever. But if they happen to pass them at night, or lie near them in an open boat, the air from those swamps is perceived to be quite chill and cold; insomuch, that warm thick clothing becomes absolutely requisite, to guard the body against the impressions of so great an alteration in the air, and of its cold and inclement quality. The smell of the swamps, and the vapour arising from them at this time, resemble the unwholesome scent of a ditch lately cleaned; and the effect upon the most healthy and vigorous constitution, is often a chilling cold fit of an ague, terminating in a fever, with delirium, bilious vomitings, a flux, or even death itself.

CXXIII. "I hope what has been said on this subject, will serve to excite some tender feelings of humanity in such as have the direction of our trade and ships abroad; as nothing can be more inhumane than sending unseasoned Europeans high up, from the mouths of rivers, into an uncultivated country, especially during the rainy season, and where there is no shelter from the pestiferous night air. This practice is the more inexcusable, as the points gained by it may generally be accomplished by other means. If it be done for the sake of wood, water, or other necessaries of life, there are few places in the world, where these cannot be brought into a fort, factory, or ship, by the natives, and persons perfectly seasoned to the country."—After the words "pestiferous night air," Dr. Lind adds in a note, (sixth edition, London

1808,) "It may be here expected, that where such duties are unavoidable, those who undertake them ought to be furnished with some precepts for their preservation. I would advise all who are employed in cutting woods, or in other laborious and dangerous services in hot climates, during the heat of the day, to have their head covered with a bladder dipped in vinegar, and to wash their mouths often with vinegar; never to swallow their spittle, but rather to chew a little rhubarb, or some other bitter, and spit it out frequently; to stop their nostrils with a small piece of linen or tow, dipped in camphorated vinegar; and to infuse some bark, garlic, and rhubarb in brandy, of which a dram is to be taken either by itself or diluted with water, morning and evening.

CXXIV. "In the evening, before sunset, they should leave off work, and not return to their labour in the morning till the sun has dispersed the unwholesome dews and vapours. For their safety during the night, they should retire to a close hut, as the dews may penetrate a tent; here, in the absence of the sun, a constant fire should be kept; or if that be found impracticable, the apartment in which they lie should be well fumigated with gunpowder, as fire and smoke will afford them the most excellent defence against the noxious and dangerous qualities of the night air. The smoaking of tobacco in their huts, and chewing of garlic, and not sleeping on the ground, are circumstances which will also contribute to their preservation.—If, from a neglect of these precautions, the nocturnal chill fog has made an impression upon the body, a vomit should immediately be administered near a good fire, and a plentiful sweat excited after it, which will often prevent fatal consequences.

If any symptoms of a low fever still continue, as a headache, a sickness at the stomach, chills, &c. a blister ought immediately to be applied, as these complaints, though seemingly so slight as not to confine the patient to his bed, are deceitful, and often terminate in a fatal malignant fever. If this fever can be brought to intermit, let the bark be immediately taken, to the quantity of the quarter of an ounce, or more, in red wine, every two hours, and the patient quickly removed into a better air."

CXXV. It is worth while to introduce the subsequent remarks of Lind, and which affords the opportunity of entering a moral remark. "If it be done for the sake of trade, might not this be effected with equal advantage, by having the trading boats or vessels managed by the natives; who are generally much better acquainted with the navigation of the rivers in their own country than strangers are? And in this case, an honest native factor," [This, in the Indo-britannic settlements, would be a very uncommon phænomenon: ever since they have intermingled with foreigners their manners have been corrupted, and their honesty and integrity, in all instances, extremely suspicious, or rather doubtful. It will be long before the vague attempts at diffusing Christianity among them, expiate for, and overcome the immorality and practical dishonesty which have been most unhappily introduced.] "or at least one or two white people, long seasoned to the climate, will be sufficient to superintend the cargo. Upon the whole, if the ships of war and others bound to the East and West Indies, were permitted, on their arrival in those parts of the world, to enter, as part of their complement, from ten to twenty blacks, or natives, to be solely employed in such duties as have been mentioned, it would undoubtedly be a means of saving the lives of many Europeans. Such may be entered on board as are fishermen by profession, or who are dexterous in the management of small vessels and boats. Thus, for example, at Jamaica, the proprietors would willingly permit the slaves to serve on board the king's ships, in the West Indies, for any length of time, provided their wages were paid to their masters. And those negroes being deprived of the means of debauchery and riot, which our seamen, when on shore, are apt to fall into, the duties of wooding and watering the ship, and all the services required of boats at night, would, in all probability, be more speedily and faithfully executed."—In the days in which Lind mentioned these proposals, the slave-trade flourished; the paucity of these unhappy mortals in the West Indies, would now, probably, prevent the adoption of his commendations.

CXXVI. "I am sensible," continues Dr. Lind, "that it is not uncommon to meet with gentlemen, who have been long in the East and West Indies, who treat all the apprehensions of sickness in those climates as imaginary; and the precautions against them as needless and chimerical. It is probable they might never have been employed in such services as I have mentioned, or have not resided much, during the sickly seasons, in very unhealthy places. If, notwithstanding these, they have been so fortunate as to enjoy good health, which many have done when well seasoned to such climates, I will address them in the words of Cicero to his friend at Baiæ, which delicious winter retreat of the ancient Romans, was remarkable then, but is much more so at present, for its unwholesome air, during three months in the summer. ‘Gratulor Baiis nostris: siquidem ut scribis salubres, repente factæ sunt: nisi forte te amant, et tibi assentiuntur, et tamdiu, dum tu ades, sint oblitæ sui. Quod quidem si ita est, minime miror, cœlum etiam et terras vim suam, si tibi ita conveniat, dimittere.’

CXXVII. “It now remains to deduce some useful conclusions from thence, for the benefit of such Europeans as settle in hot climates.—The first is, That the diseases of strangers, in different climates, bear every where a great similitude to each other; that the violence or malignity of the fevers and fluxes to which they are subject, depend, in a great measure, upon the degrees of heat and moisture; and that they are particularly influenced by the nature of the soil and of the winds.—Secondly, there is scarcely any country, however unhealthy, that has not its healthy and pleasant seasons. These last continue for the greatest part of the year, and, at such times, it may with safety be visited by strangers.—Thirdly, the most unhealthy spots in the world have in their neighbourhood, and often at no great distance from them, places which afford a secure retreat from sickness. This has already appeared in part, and will be more fully proved in the sequel. In a word, the diseases most fatal to strangers in every country, seem not only to be confined to particular seasons, but, even during these seasons, to certain places only.—Fourthly, by length of time, the constitution of Europeans becomes seasoned to the East and West Indian climates, if it is not injured by the repeated attacks of sickness, upon their first arrival. Europeans, when thus habituated, are generally subject to as few diseases abroad, as those who reside at home; in so much, that many persons, dreading what they may be again exposed to suffer from a change of climate, choose rather to spend the remainder of their lives abroad, than to return to their native country.

CXXVIII. "These positions are very interesting to all who go abroad; and they lead us to the important object of this Treatise, the preserving annually a multitude of lives, as they point clearly out to us the easiest and most effectual method for accomplishing that great purpose.—Strangers should always leave unhealthy spots, for a few months, during the sickly season, until they become well inured to the climate. This removal to a small distance from the seat of sickness, promises a security, at least equally certain with the method now taken by Europeans, of shutting themselves up in their houses, and having no communication with the natives, during the rage of the plague in Turkey. It is likewise a precaution, upon which the safety of strangers, in unhealthy climates, may sometimes alone depend." Dr. Lind adds, "One cannot, without astonishment, reflect on the blindness of mankind, in never discovering this so simple and easy a method, which their own observation must have every day pointed out to them: yet our factories abroad have never paid any attention to it, and a proper method of doing it has never been recommended to them."—He then goes on to describe some methods of retreating from sickly places, and to mention some healthy spots even near those which are commonly considered and experienced to be unwholesome: but, for particulars, reference must again be made to Dr. Lind's publication.

CXXIX. The following may be subjoined, as, at least, affording an article of curiosity. It may here be observed, that he on particular situations and coasts, &c. recommends vessels, or floating machines, at a distance from the source of the mischief. He remarks: "But we must not confound our idea of people, pent up in a small ship, or in a vessel at sea, undergoing all manner of hardships, suffering extreme hunger, incessant fatigue, and frequent disappointments, with the situation of persons living at ease, in a commodious ship, and furnished with all sorts of necessaries, by means of a daily intercourse with the country.—The admirals of our fleet, and captains of our ships of war, find in few places abroad, better entertainment, or more convenience, than in their own ships. In like manner, a floating factory may be fitted up, in any taste whatever, either for convenience or pleasure. Mr. Doidge, late Secretary to Admiral Watson, in the East Indies, upon his return home, being in an ill state of health, and having always found himself better when on the water, contrived a vessel of a commodious form, to which he gave the name of the Ark, in which he had resolved to spend much of his time. This little floating house, contained a wine and coal cellar, a kitchen, a dining-room, and a sleeping-room, elegantly furnished, and an apartment for his servants In this floating mansion, he proposed to reside during the heat of the summer, as a pleasant and cool retreat, for the benefit of his own health, as well as the entertainment of his friends."

CXXX. A multitude of preservatives, preventatives, or prophylactics, have been at these times recommended; but, generally speaking, they may be considered insignificant and unavailing. They commonly possess no positive or specific faculty, in obviating the morbific operation of these unknown, but subtile and powerful causes of disease. There is scarcely any evidence that Peruvian bark, ardent spirits, vinous liquors, tobacco, and a thousand other substances, proposed and occasionally used, have been productive of such acceptable and beneficial effects. Their influence is, perchance, indirectly operative, through the medium of the imagination. It is universally understood, that supporting a comfortable cheerfulness of imagination, or confidence, is a consideration of wonderful importance. The influence of imaginary impressions upon corporeal structure, is often so extensive as to exceed all credibility, all calculation; and hath great power in the production, aggravation, mitigation, and overcoming of indisposition.

CXXXI. Amongst the illiterate and uninformed, and those who are incapable of calculating consequences, from the action of circumstances—but, at the same time, are exceedingly credulous—a considerable and superstitious trust is frequently reposed in imaginable preventatives; and, in particular circumstances, it may be improper to discourage the predominance of the supposition. These gratuitously assumptive prophylactics, sometimes maintain an operation or impression upon the minds of men; although an influence which cannot be adequately or sufficiently comprehended by any explanation, instituted upon declarative physical principles. And this, as insinuated, is more especially exemplified in the unlettered part of mankind, of which sailors form so remarkable an illustration. These men, then, are often affected by the presence or absence of substances, on which they lay gladdening and supporting confidence. The management of these matters, it is reasonably supposed, or rather the proposition, is susceptible of confirmation, must be conducted upon generally operating principles. The men should be properly and regularly victualled, and preserved in a cheerful condition, by superintending gentleness and countenance; and exemplary behaviour, soberness, and the most invincible regularity. Attention to clothing, and its suitable adaptation to the climate, situation, and nocturnal and diurnal alternations of temperature. Sufficient attention also to personal cleanliness, particular regularity in their intestinal discharges, with a sufficiency of evacuation, obviating constantly and accurately the collection of offending fæculence, as being in these circumstances always peculiarly pernicious. The conscientious avoidance of inebriation, or the smallest approach thereunto; the necessary attention to dryness of situation when they are unoccupied; if requisite, the removal of moistened garments, and, especially, when they pass into a temporary quiescent condition; sheltering most carefully in the night, &c. from all dampness, either on the terrestrial surface, or as descending from the atmosphere;—all these considerations will be particularly efficacious. These observations and precautions, although too often disregarded, or considered as of no importance, will, however, be found to be, for the most part, incomparably advantageous. Shadowing also, as far as possible, from powerful solar influence, should be carefully observed: hence the impropriety of exposing men incautiously, or unprotected, in the operations of watering and wooding, in the influence of the sun's blaze in a tropical climate. Regular and thorough digestion, suitable undecayed nutriment, swallowed in moderate quantities, and regularly supplied, or seasonably administered. An energetic state of the circulation, on or at the surface; courage, or the lively action of confidence, &c. comprehend all the mysteries impliedly conceivable in their preservation. Some of these commendations, are judged more particularly applicable to them, when obnoxious to the unwholesome evaporations from marshes and other pestiferous surfaces.

CXXXII. Part of the preceding subject revolves for some additional examination; and here the influence of habitude should, in the attempts of preserving the health of seafaring people, never be overlooked. From the antecedent desultory reflections, it may be perceived, that the power or faculty, for opposing or resisting the impression of the operations of climate, situation, &c. is modified, in an important degree, by this progressively superinduced constitutional qualification. An attempt to undertake an explanation of the physical alterations, invisibly, and sometimes slowly introduced in the human body, from the operation of prolonged exposure to a particularity of circumstances, would here be irrelevant, and, consequently, unseasonable and unsatisfactory. That this adventitious modification of constitution, is subservient to the preservation of residents in tropical, and other unduly heated climates—or, in any regions naturally peculiar for their influencing properties—is so universally and remarkably experienced, as not to need any particular confirmation. The advantages redounding from the modified state of constitution here contemplated, has been frequently ascertained by autoptical observation. The quotation from Dr. Lind, upon the same subject, has been purposely introduced, as an additional corroboration of the proposition; but it must be admitted, with the allowances and precautions, which he has so discreetly and knowingly intermingled and communicated.

CXXXIII. It is observeable, that impressions are commonly regulated and influenced in their operation, conformably to the state of the constitutional susceptibility; and the frequency, and other concomitants of their application. This artificially imparted peculiarity, is admirably exemplified in some of the confederated, congregated, and frequently implicated capabilities, slowly acquireable, but ultimately confirmable, even in childhood and adolescence; or those superinduced qualifications, obtainable by the interposition of predilection and indefatigable perseverance, and aided by pertinacious intellectual superintendence. After the habitude, however, is sufficiently established, the performance of seemingly even the most complicated undertakings and operations, proceeds with comparative adroitness, convenience, and quickness. Sometimes the operation may be performed, without even any evident mental attention; and what may seem improbable, nay, incredible, has certainly been accomplished by the same individual. This artificial acquirement may relate either to the body or the mind, or to both, in conjoined efficiency. An example has occurred, where a man could actually deliver a rational discourse, while he was earnestly studying the complicated propositions of mathematics. This is an occurrence of a very extraordinary description; and an accidental interruption to either of the processes, would, in all probability, have overthrown the whole proceeding. This combination of mental exertion is extremely infrequent, and apparently presupposes an inexplicable idiosyncrasy. An expert fiddler and teacher of dancing, may unite the scientific performance upon his instrument; and, at same time, be displaying and exemplifying the most complex and difficult movements in the other department of his occupation. It is perfectly well known, that either of these practices, is at first attainable, only by the most attentive diligence and indefatigable application. Vulcan's fingers are certainly capable of tolerating a higher degree of heat, than is ordinarily practicable by those unaccustomed. The warrior can endure the vaporations of fulminating and decomposed gunpowder, and the roaring of cannon, and the rattling of musquets; and yet his organs of smelling and hearing be neither materially discommoded nor stupified. The votive friend of Bacchus may, with apparent impunity, swallow a larger portion of vinous liquor, and the gormandizer may continue to ingurgitate voraciously, without immediately suffocating or overwhelming, what was, peradventure, a well contrived constitution. In these also, the dominion of habitude has a wonderful ascendency, and difficultly determinable preservative power; but the latter are examples unworthy of imitation.

CXXXIV. The following is frequently a veritable conclusion, and especially applicable to the subject in consideration. The Briton may remain in Indian climates, for several years, and if he is regular and temperate, and fortunately surmounts the hurtful influence of his situation, he will afterwards consider a temperature of 70°, or even 80°, preferable to that of 50° or 60° in his native country. Repeated examples have happened of persons who have for many years resided in India, and afterwards returning to Britain, have passed a short time; but who have speedily disrelished the comparative coldness and uncertainty of the climate, and even been disgusted with the manners and practices of their countrymen; or, probably, have been displeased with the British method of cooking; and who thus, with abhorrence, have bid a lasting farewell to their native country, and again embarked for the enjoyments of the oriental territories. These constitute stubborn examples of the invincible disposition of even artificial association. In some of these instances, the gratification of sense, the pleasing of the palate, the satisfying of a lickerish stomach, especially seem to have been the predominating considerations.

"Sperne voluptates. Nocet empta dolore voluptas."

CXXXV. This preference and easiness of endurance of augmented temperature, are in him adventitious qualifications; they are not originally or primitively subsisting, but are the consequence of the modifying influence of reiterated and confirming exposure to extraneous impression. The effects of these impressions were at first, very likely, particularly unpleasant; but, by progressive acquaintance, and imperceptible reconciliation, and constitutional accommodation, are exchanged into considerations of indifference, or even of acceptable presentation; "consuetudine quasi altera natura efficitur." Some of the preceding instances may be considered as explicable upon mechanical principles. In the blacksmith's example, the resisting property is chiefly produced by the induration and callosity of his cuticle, and consequently impaired or deadened sensibility. All the enumerated instances, however, are not submissive to such an explanation. Peculiar, but unknown alterations, are wrought in the functionary properties of muscular substance; the nervous energy, too, is frequently variegated in its distribution and properties, and sensitive and governing efficiency. The circulation, also, is particularly influenced; arterial pulsation is generally accelerated, sometimes increased in strength, but imperfect in regularity and firmness; but these things are liable to great diversity, as may, in some measure, be comprehended from the foregoing scattered observations. An alteration of the balance subsisting betwixt the surface and internal organs, must, also, be a frequently intervening circumstance: but an examination of these phænomena would lead into lengthened physiologic and pathologic disquisitions, inconsistent with the intent and purport of this undertaking.

CXXXVI. Dr. Cullen has made the following ingenious observations on Custom and its modifying influence. 1. "That custom determines the degree of tension necessary to the action of muscular fibres. 2. That custom associates motions with sensations, which are not otherwise their causes; so that the renewal of the sensation, or of its idea, renews also the motion. 3. That custom associates different motions, so that they cannot be separately performed, though not originally nor necessarily connected. 4. That custom determines the degree of force and velocity with which motions can be performed. 5. That custom determines the order of succession in associated motions, and the velocity with which they shall succeed one another. 6. That custom establishes the periodical return of certain sensations and motions, not originally necessary to the œconomy. 7. That custom fixes an exact period for the return of certain sensations and motions, which, by the laws of the œconomy, are disposed to return at intervals otherwise undetermined. These laws, which may be established by custom, are many of them with difficulty avoided; they are often rigidly fixed, have a considerable influence on the action of the brain, and govern the revolutions of the animal system. Thus, any causes producing a deviation from the usual degree of force and velocity, (4.) are apt to destroy it altogether; and, in like manner, causes producing a deviation from the usual order and velocity in the succession of motions, (5.) are apt to destroy the power of the mind in following that order, or in giving any measure to the several motions which should be performed; and perhaps, in this way, the effects of debility, of several passions, and of surprise, are in some measure to be explained."

CXXXVII. According to common observation, (the scene is supposed to be laid in a warm climate,) the augmented perspiration appears the most remarkable circumstance, upon passing into those regions under the force of high temperature. After a considerable stay in these climates, however, it is, in a similitude of circumstances, for the most part, evidently diminished. The imported inhabitants gradually acquire some of the more naturally customary properties of the natives; and thus, this beneficially, but artificially superadded qualification, is, in combination with moderation, regularity, &c. the most effectual preservative of strangers, in their residence in tropical countries. The occurrence of extraordinary perspiration is, it should be remarked, absolutely requisite for those entering upon the warmer regions, although it is sometimes productive of its misfortunes; and of these, slowness of the bowels, and disposition to disorder of the liver, are some of the most unsuspected, troublesome, and mischievous. In the preservation of health in the warmer climates, these considerations and circumstances are of the greatest moment; although too often disregarded, or deemed inconsiderable. Tardiness of intestinal revolution, is a common and injurious consequence of augmented superficial transpiration. The general relation of those not accustomed to the operation of high temperature, and the changes induced in the course of their peregrinations, are subjects of singular importance; but the full examination of them, in all their bearings and influences, would far exceed the intention of this dissertation. The accommodated management of the constitutions, not only of those who may have previously been unaccustomed to such circumstances, but likeways of many after prolonged residence in such climates, is an indispensable consideration. But as the history and treatment of disease do not form any immediate part of these disquisitions, and also for the reason lately assigned, lengthened discussion is inadmissible.

CXXXVIII. The diseases most commonly affecting strangers, upon their settlement in foreign climates, are apparently produced by the excessive temperature, and some other unfavourable circumstances with which they are more immediately encompassed. And, amongst these things, may justly be enumerated their own numberless irregularities, indiscretions, and mismanagement. Some additional hints for the prevention or abatement of these misfortunes, as frequently troublesome or dangerous to those not familiarized with such circumstances, may here be propounded. When possible, they should continue under coverture, especially in the warmest time of the day, until they are fitted gradually for the endurance of the necessary exposure attending their employments. The quantity of clothing, (as will hereafter be more distinctly explained,) should be regulated and proportioned, according to particular requisitions, or the necessities of individuals, or their own experienced convenience. The head should be properly defended from the operation of insolation; and, for this purpose, several of the coverings used by the natives appear suitably contrived. If the heat induces headache, the head should be frequently moistened with cold water; or this mixed with some common salt, or nitre, or with some vinegar —which will assist its cooling powers considerably; or the affusion of this liquid will sometimes be more immediately serviceable. A moistened kerchief may be retained in the hat, if the exposure is to be protracted. As formerly and strongly recommended, regularity of the intestinal evacuation cannot be too carefully maintained, by all those committing themselves to the hazardous exposure in these countries.

CXXXIX. In some particular situations and conditions, the greatest attention should be bestowed, where there is an imperious desire for quenching thirst: mischievous consequences having often arisen, from imprudently swallowing large quantities of watery liquids, and more especially when the person has been previously perspiring copiously, and perhaps, at same time, become fatigued or debilitated. When violent or continued exercise has been employed, and consequently an additional quantity of caloric evolved; and when, from the speediness of the evaporation, the superficial temperature is probably in a state of unnatural declination or repression; and when lassitude, feebleness, &c. have supervened; when the general frame is more or less agitated; when the person's feelings are somewhat like those occasionally observeable in febrile attacks; and when the state of the stomach, an organ essentially important in the animate machine, is confused and disturbed. At this critical moment, the reception of cool liquids into the stomach, deprives it of part of its natural caloric, (whereby the nervous energy, whether this be the Galvanic influence, or what subtile power or property soever, is affected, &c.) and renders its actions irregular and spasmodic; which have a wonderful, powerful, diffusive and sympathetic influence on the constitution: but, as just insinuated, the nervous properties are more especially and pointedly implicated. By this inadvertent and imprudent employment of an undue quantity of cool liquid, death is sometimes almost the immediate consequence; whereas, an equal quantity, gradually and cautiously swallowed, would have induced a salutary and refreshing operation and influence. In these circumstances, the quantity required for relieving thirst should be gradually and heedfully swallowed; and, if no uneasiness is thus excited, it may be suitably repeated, until the gratifying quantity is received. If the perceptions of refreshment and invigoration, &c. arise, and superficial perspiration remains uninterrupted, (and the occurrence of no particular disturbance at the stomach,) together with the mouth and tongue agreeably moist, then there need be no apprehension. These misfortunes are most liable to happen in the hottest seasons of the temperate latitudes, or when the system is greatly heated in any country; but, probably, (at least as far as observation has extended,) not so commonly in the warmer or tropical. And this difference, again, is explainable from the approaching state, in the latter regions, of the aquatic and atmospheric temperature. In the tropical regions, the heat of the water and surrounding air are near the state of equality; so that these deadly effects must be seldom induced, unless by the most blameable mismanagement, or when the water may have been artificially and considerably refrigerated. For, generally, in proportion to the existing inequality of the temperature of the water, and of the animal swallowing it, so will, commonly, be the magnitude and importance of the consequences.

CXL. The approach to uniformity of temperature, in fountains and aqueous collections in tropical latitudes, to that of the atmosphere, must be the principal reason why bathing in, or drinking of water, in these regions, is generally harmless, or accompanied with comparative little inconvenience. This, however, it may be remarked, will be, in some measure, determined by the condition of the body, at the time of immersion or drinking. If the body has been over-heated, (to employ rather a vulgar expression,) and perhaps weakness, or feelings of exhaustion, induced before the application, and the temperature of the water much below 75°, its unseasonable employment may be occasionally productive of disagreeable consequences.—Attempts have been made to estimate the mean, or middle annual temperature of the different latitudes, extending from the poles to the equinoctial. These estimations have been instituted upon different premises, or fundamenta of calculation; and such as occasional observations, in various parts of the earth's surface, and at different seasons of the year; the temperature of springs, issuing in particular situations; or of the earth, at ascertained or determined depths from its surface. As already observed, the middle annual temperature at the equator, and for two or three degrees northward and southward of this imaginary central lineation, has been estimated at about 84°; and that of the tropics (or at 23° 30° north and south,) will be about 76°, upon the foresaid principles of calculation. The mean annual temperature, therefore, of the tropical latitudes, as they are customarily denominated, will be found to be about 80° of Fahrenheit's thermometer. If, in these regions, the temperature of the water at a moderate depth, or flowing from springs, be about 70° to 75°, the difference betwixt this and the intermedial atmospheric temperature will be so inconsiderable, that it is seldom the cause of much inconvenience from its application.—The temperature of the Arctic circle has been assumed to be about 40°; and if this, and the conclusion respecting the tropics, be veritable or probable, then the mean annual heat of the temperate latitudes, as they are commonly, but rather unsuitably named, will be 60°; and this, strictly speaking, applies to the middle distance of these latitudes. This line, then, bisects the southern provinces of France, crosses northern Italy, not far from the native village of Virgil, and then traverses the middle regions of Asia; all which may be considered the most fertile and populous of the earth's surface. In these regions, which are of prodigious amplitude, the intermedial temperature of the fountains, &c. will have a close correspondence to the mean of the atmosphere. From ascertaining the middle, or, perhaps, it may be called the constant mean, of certain springs, with occasional allowances for the peculiarities of situations, the mean of the annual period of respective territories may be determinable.

CXLI. It was lately mentioned, that, as far as autoptical observation has extended, accidents from the imprudent swallowing of cool water, are most apt to occur in the warmer seasons of the variable latitudes. The explanation of this occurrence, is, probably, deducible from the subsequent considerations, or, which indeed might be completely understood, from what has been said on the mutability of atmospheric temperature. The nature and relation of the subject, may be illustrated by referring to Britain for exemplification. The whole of this renowned island lies betwixt 50° to 59° of northern latitude: the mean temperature of the southern extremity may be estimated at 53°, and the northern at about 45°; the intervening proportion, therefore, of the island, will be 49° for the mean temperature. The temperature of the springs (it is needless to observe, that the thermæ, or warm springs, are excluded,) of Great Britain, will be about 45° to 47°; and this holds, even in these northern latitudes, with scarcely any fluctuation. In the warmer season of the year, from July to September, the heat sometimes rises nearly as high as that between the tropics. This is the time, also, when some of the most laborious exercises are performed in the fields, and when, consequently, those exposed are frequently perspiring copiously; and this is commonly succeeded by debilitation. Continuing these labours, thirst is one of the most troublesome circumstances. The incautious are thus occasionally apt to do mischief, by attempting hastily to quench their thirst, and sometimes ingurgitate a large quantity of cool water; being unacquainted with the evils which may, in probability, be superinduced. The difference of the temperature of the fluid thus drunk, and of their bodies, is very considerable; and the quantities swallowed, have a greater effect than in the cooler seasons of the same latitudes. But, at any season of the year, in the variable (but occasionally temperate) latitudes, if the body has been much affected by violent exercise, as in dancing, the drinking of water, even at the intermediate temperature, may produce mischievous consequences. The greatest fatality induced by the rash use of cold water, was that which happened to the army of Alexander at the river Cydnus. These observations are not exclusively applicable to those living on shore; they are of importance to those who may be labouring on shipboard.

CXLII. Having made these fundamental and leading observations, on a subject of extensive consequence, the following, on the difference of the temperature of aqueous expanses and collections, may not be superfluous nor unserviceable: It may be remarked, that, in aqueous collections, the intermutual communication of temperature is most remarkable near the surface; and hence, when these are not very deep, the whole may come near to equability. It has been ascertained, by experiment, that in extensive collections of water, the fluid, beyond a certain depth, is seemingly of a particular degree of temperature at all seasons of the year; or, at least, the difference, as far as experiment has been instituted, is inconsiderable. The bottoms of deep lakes, therefore, are always cold, both in summer and winter. By a collective deduction, from observations performed at great depths, the temperature of the water seems to remain nearly at that degree at which the density (and consequent specific gravity,) of this fluid has been found to be the greatest. About 41°, with occasional variations, seems to be the point of temperature which has been most commonly observeable. It may here be remarked, that the temperature of the greater depths of water cannot be determined by Fahrenheit's thermometer; it is to be accomplished only by an instrument, sometimes denominated register thermometer; which afterwards indicates the lowest point of depression which may have occurred during the observation. And it appears to be further confirmed, that, in extensive gatherings of water, and even in the summer season, there is not much difference in the temperature, beyond the depth of fifteen to forty fathoms. This approach to an evenness of temperature, at a certain depth, has been found to prevail as far south as the lakes of Switzerland ; and, in latitude of 65° N., Lord Mulgrave, at the great depth of 4100 feet, or $1366\frac{2}{3}$ yards, or $683\frac{1}{3}$ fathoms, found it at the temperature of 40°, while the water at the surface was 55° of the thermometer. The temperature, however, as far as research has extended, is modified by the regions in which the experiment is conducted; agreeably to their nearness to, or remoteness from, the equinoctial. But in all parts of the world, in great bodies of water, the temperature descends from the surface until it comes to a certain degree, which will, in some measure, be regulated by the latitude and elevation of the place of observation. In some of the tropical regions, the temperature of the water at the surface may be as high as 70° or 75°; and what it is at great depths, is probably not so well ascertained. This highness of superficial temperature may take place even in the Mediterranean, as elsewhere observed; or at considerable depths, when the water is influenced by the heated shores, this circumstance may be remarkable. And Mulgrave found, in 66° of north latitude, at the amazing depth of 4680 feet, that the temperature was as low as 26°, or 6° below the point indicating the beginning of congelation. In conclusion, on these regulating observations it may be remarked, that the declension of temperature, at any season of the annual revolution betwixt the tropics and the equator, is not very considerable. As far as can be determined, the variableness of temperature in the hyperborean regions, is never exceedingly remarkable. Eight degrees will, perhaps, comprehend all the fluctuation of temperature in the regions aforementioned.

CXLIII. The foregoing observations are applicable to mariners, or others, when placed in a similitude of circumstances, in any of the tropical climates. A multitude of circumstances must be taken into consideration, in attempting to maintain the health of seafaring people, in the different climates in which they may be exposed. In these reflections upon the atmosphere, comprising some of its more remarkable qualifications, &c. and modifications, impregnations, &c. every circumstance did not require a particular examination. The principal objects, in relation to this department of the undertaking, are the temperature of the atmosphere; and this either in a prejudicial state of depression or increment; its uncommon dampness and dryness, and also the different exhalations with which it may be charged. It is always more or less influenced in its nature and powers, by these adventitious and unessential communications. These foreign matters mingling with the air, very commonly have no perceptible or intelligible effect upon the human constitution; but this is far from being continually applicable. The atmosphere, however, is often the storehouse of disengaged mischief, and in this manner is capable of conveying or exciting different diseases. Intermittents, and other febrile affections, have often been produced by the morbiferous exhalations issuing from insalubrious spots of the earth into the atmosphere.

CXLIV. Forsaking these unfriendly and implacable latitudes for a little season, the course may now be steered to the more temperate and endurable southern or northern territories. The latter being more particularly appropriated to the accommodation and subsistence of the reclaimed portion of mankind, they will, therefore, be more interesting, and deserving of some additional consideration. In these regions, therefore, mankind and animated creatures, generally, dissipate with comparatively less inconvenience and debilitation, their unassimilated, and, consequently, superfluous temperature. They, moreover, enjoy, with occasional exceptions, a moderate or rather depressed, and frequently changeable atmospheric temperature. What in tropical climates, &c. is accomplished by evaporation from the surface, is, in the colder, oftentimes performed through the intervention of diminished temperature. A subduction or abatement of warmth, within a moderate limitation, is, to most animals, generally acceptable. Man commonly appears most comfortable and exhilirated, when there is temperate coolness of the atmosphere. This state, to be agreeable and satisfactory, must be considerably below his own temperature. The temperature, fluctuating between 55° and 70° of Fahrenheit, will, to the inhabitants of the temperate latitudes, be almost constantly the most approveable and delightful. Encompassed with these advantageous circumstances, proportionally agreeable, and vigorously healthful perceptions, then ordinarily commence; and the unpleasant languidness, and inexpugnable disinclination and irresolution, the troublesome concomitants of augmented temperature, disappear. A redintegrated readiness of inclination, and promptitude to performance, generally succeed; and what previously seemed an ungracious or intolerable enterprise, is now resolutely undertaken, and unexpectedly conquerable. There arises, likeways, a more obsequious and successful resolution for performance; labour is discharged with renovated steadiness, and all the corporeal functions executed with apparent easiness and regularity. These, then, are the counterpoise of those troublesome circumstances already particularized, as so ordinarily remarkable in aggravation of temperature.

CXLV. The reduction of warmth, on the other hand, below a certain degree, is to animals likeways disagreeable, and sooner or later injurious. Amongst the natives of the more inclement latitudes, it is generally tolerable, unless the declension has been very considerable. A diminution to the freezing standard, causes, in most people, unpleasant perceptions. When the coldness (or, by another expression, declension of calorific efficiency,) becomes excessive, the consequences then are troublesome; and, if the application of the cause be protracted, will ultimately be absolutely destructive. Difficult it would be, accurately to determine, whether animals possessing the degree of warmth peculiar to mankind, be capable of enduring and resisting, with proportionate convenience, a temperature which ascends to a certain number of degrees above their ordinary corporeal standard; or, conversely, a reducement to an equal rate below their accustomed proportion? Or let it be illustrated by this proposition: whether will an animal, whose ordinary standard of heat is about a 100°, bear an elevation to 200°, or a reduction to -0°, or the beginning of the thermometer, with corresponding and apportionate indifference? The elevation and depression from the animal standard, in this proposition, have a correlative proportion to the point of incipient departure of progressive and retrograde measurement. If particular precautions be disregarded, probability supports the conclusion—that the augmented temperature is longer endurable or sufferable, without such deadly effects, than the diminished. A reasonable, and, apparently, the applicable explication of this, has been already propounded.

CXLVI. The absolute degree of reduction, or increase of caloric, tolerable by animals, will be governable or regulated by a reciprocal proportion, subsisting betwixt the animal operation evolving it, and the hastiness or quickness of its application to, or dispersion from, the surface. But the continuance of importantly augmented, or diminished temperature, would soon destroy the living powers both of vegetables and animals. When atmospheric, or, perhaps, rather terrestrial reflected or radiated temperature—and, consequently, that of surrounding substances—is remarkably or extensively subtracted, then unpleasant and destructive operations upon those exposed commence. These effects of lessened temperature, are the frequent subjects of observation in the more inclement and variable latitudes. In particular states of the atmosphere, a very inconsiderable lowering of temperature will occasionally superinduce troublesome, or even lethiferous consequences. The degree of heat does not require to be reduced below 32°, or the indication of freezing, to produce injurious influence upon animated structure. And, what is still more, a declension to 40° or 45° only, and, more particularly, if accompanied with uncommon dampness, and a tumultuous and irregular condition of the atmosphere, introduces more prejudicial consequences than a subsidence of the thermometer to 32°, if unattended with these unfavourable circumstances. And thus, it has been generally observed, that the influence of cold has been greatly sharpened by the falling of snow, sleet, &c. (which, as formerly remarked, may happen, although the inferior regions of the atmosphere, as determined by the thermometer, are in possession of moderate temperature,) upon those in exposure to these occurrences. The explanation of this can be apprehended from the antecedent observations upon the abstraction of heat from the surface of breathing animals. It has been ascertained, that those animals which occasionally interrupt their respiration, and also those which always use only a diminutive proportion of air in respiration, scarcely equal, or do not surpass, the temperature of the surrounding substances. And it likeways appears, that they are not so much incommoded by severe depressions of temperature, as those naturally possessing a more extensive proportion of this imparted property.

CXLVII. The operation of cold, therefore, must be mischievous whenever it becomes considerable, either in vehemence or continuation; and whensoever the heat of the person is more rapidly dissipated than it can be reproduced. The coldness of the atmosphere is the fruitful cause of manifold complaints, from the most superficial inconvenience, to death itself; the "ultima linea rerum"—the termination of temporal existence. The diseases more especially resulting from the action of diminished, or rather of variable temperature, are ordinarily of an inflammatory description. The greatest attention becomes requisite in managing the clothing, manner of living, condition of lodging, and exposure to alternating occurrence of augmentation and reducement of temperature; or, that the subjection to the inclemency of the weather, may be as prudently and cautiously conducted as practicably admissible.—Those who have been exposed to high cold, should not hastily advance into a warmed apartment, the transition should be carefully and opportunely performed. And it also deserves attention, that those who have been obnoxious to circumstances of an opposite description, should observe a precaution correlatively applicable. Imprudence, and inattention to appropriate management in the colder weather of the mutable countries, are productive of many of the mischiefs and afflictions so commonly prevalent in these territories. Chilblains, inflammatory affections of the extremities, cynanche, pneumonia, rheumatism, catarrhus, &c. frequently originate from these powerful and precipitate alternations. As long as the common quantities of clothing are employed, and the subsidence of the temperature is not immoderate,—and, especially, where the health is complete and steadfast, —the operation of these unfavourable circumstances is not so immediately prejudicial or destructive. The forementioned complaints, and a multitude of anamolous symptoms, are more ordinarily the supervenient misfortunes. When the extenuation of surrounding temperature becomes more remarkable and unintermitted, its pernicious influence is still more tremendous and irresistible. The natural degree of animal heat, is more largely and rapidly dispersed, than it can be extricated and rendered sensible by the efficiency of animate, or chemico-animal calorific operation.—The extremities, for obvious reasons, first suffer; their natural warmth is more suddenly removed than it can, in these remoter members, be disengaged and distributed; and this circumstance is, doubtlessly, in part, owing to the primary action of the cold;—the repulsion of, and, consequently, enfeebled circulation. Those members, therefore, which are remotest from the point of active and living power, (or vital energy,) and propulsive motion, are evidently the first and most materially affected. The conducting or conveying power of solid bodies, if in possession of an absolute equality; the smaller, therefore, the actual or positive cubical measure of any limb, so much the more swiftly will its peculiar and relative proportion of caloric be dissipated. The external surface collapses, and the largeness or magnitude of the different members in exposition is diminished. This is another evidence, that even animate structure, within a moderate limitation, is thus modifiable in its measurement, conformably to the degree of temperature. This apparently happens, even although allowance be made for the diminution of the quantity of circulation, which previously proceeded more vigorously at the surface. If it be allowable to use rather a mechanical expression, it is propelled internally, and moves for some time in the dilatable and capacious deeper-seated blood-vessels. This repulsion of the superficial sanguineous circulation, indirectly contributes to the aggravation of the mischievous operation, supposed to have already commenced. The remaining superficial or external temperature, is perpetually diminishing; and also the person's capacity of maintaining this absolutely requisite constitutional qualification. Whether these two circumstances can be supposed to have any corresponding proportion, is a proposition which seems, in the present state of knowledge, altogether insoluble.

CXLVIII. The coldness of the air used in respiration, is, probably, materially conducive to the progress of the calamity; which might be ascertained, by causing an animal to breathe warm air, while the body was subjected to the unrestrained influence of the diminutive temperature. The surface is sometimes subpallid, or speckled, or curiously variegated with different shades of paleness, blueness, duskiness, &c.; or these colorations are confusedly intermingled, or alternating both in their respective intensities and localities. The countenance has, occasionally, some appearance of floridness; or it seems mingled with various colours, and exchanging uncertainly, from the most obscurely observeable rubescence, to different gradations of brownish purple; and, often when the evil has been continued, to dirty paleness: but this frightful paleness of the countenance, with blueness of the lips, and of the parts encircling the eyes, are most remarkable. The sufferer, as long as the power of common sensation remains, perceives an unnatural numbness, and sometimes an indistinct or deceptive sensation, imparted through the medium of feeling; variously wandering, recurrent, thrilling, throbbing, shivering; or, instead of this latter, that of chilliness; sometimes that of partially, but transiently increased warmth. These phænomena will be regulated and moderated by the state of constitution; by the particular derivation and distribution of the blood, and also the condition of the nervous faculty, or by all these in conjunction. The circulation and nervous influence are continually and absolutely dependant upon an intermutual co-operation. The imperfection, or accidental disturbance of the one, disqualifies and incommodes the other with sympathetic reciprocation. These are subservient to each other, in their original formation, increase and perfection, and in their constantly necessary functions.

CXLIX. Those general and more external symptoms, produced by the absorption and abstraction of outward animal heat, are attended with a smaller or greater degree of coldness, stiffness, uneasiness, and impaired sensibility, and, consequently, proportional immobility in the different members, which may have been more immediately in unfavourable exposition. A sensation of fulness and anxiety is sometimes perceptible in the thorax, or this is definable by saying, that there is a heaviness or oppression on the respiration; and the sensation of anguish and despair is more immediately referable to the epigastrium. When the superficial temperature is considerably diminished, the perception of augmented and unnatural internal warmth, may sometimes be perceptible. Headache, too, may occasionally take place, and incidental confusion, or incapacity of cogitation. The truth is, that under the action of severe cold, the mental powers flag very seriously. The person is now more afflicted with chilliness or shivering; he becomes listless, languid, and benumbed, or is perhaps almost destitute of the faculty of sensation. If he is travelling, he becomes indifferent or disinclined to, or perhaps rather incapable of continuing his movements; a lethargic propensity or disposition supervenes, and the hopeless sufferer consigns himself to the inexorable rigidness of his misfortunes. The extremities, and other outward parts of the body, in which the circulation has been much weakened, or perhaps nearly interrupted, continue to be more seriously and deeply affected. The natural temperature is more and more diminished; and the formerly enumerated appearances (at least some of them,) more conspicuously remarkable and formidable. The quantity and strength of the circulation are much diminished at the surface. The blood-vessels in the remotest extremities, perhaps, do not now transmit the half of their customary quantity; or, what is more probable, have lost for ever their accustomed vibration. The eyes, in the progress of these symptoms, lose their native and healthy lustre, vivacity, and prominent fulness and roundness; they perhaps appear wandering, (but this will only be seen in the earlier stages,) a sure sign of their action having become indeterminate; or they are motionless, shrunk, and robbed of their resplendent clearness. The pupillæ are sometimes expanded, or otherways contracted, and, occasionally, seemingly unchanged. The features are collapsed, or, perhaps, rather inflated and distorted, and the visage is strangely variegated; the tongue swollen and protruded, the lips bluish, or this tint mixed with a confused obscure paleness. (The nervous energy latterly becomes subdued, and, consequently, all sensibility relatively impaired or obliterated.) If a thermometer were now applied to the surface, (although the influence of the atmosphere should be excluded,) it would indicate a reduction of heat greatly below the natural and healthy standard. Arterial pulsation, even in the more powerful and capacious vessels, becomes extremely debilitated, and commonly irregular and lessened in its customary frequency. Gangrene and sphacelus sometimes appear; and commence, more especially, in the ears, nose, or other extremities. The lethargic, or rather, perhaps, apoplectic affection, is increased, and all consciousness is completely abolished, and now an universal stiffness and cadaverous appearance become frightfully conspicuous. But here it is unnecessary to enumerate every contingent and particular circumstance, or the multifarious phænomena, which may be observeable in different instances, nor the distinguishing characteristics of misfortunes originating more immediately from the abstraction of heat in an intolerable degree, from those which may have proved fatal before the application, or during the operation of diminished temperature. Considerations of this description would, unavoidably, lead into complicated disquisitions upon the nosognŏmonicĕ, which is not consistent with the design of this undertaking.

CL. In the attempts to resuscitate persons not wholly extinguished by the unnatural abstraction of temperature, a thermometer will be serviceable in determining the remaining proportion of caloric of the person who may have been either partially or generally affected, and in regulating the applications used for his restoration. At the commencement of resuscitation, the means thus employed should, in their temperature, not considerably outbalance that of the surface of the body, and be successively augmented, in proportion to its progressive reproduction. And if the natural heat has been greatly dissipated, snow, or pounded ice, will be suitable articles at the beginning; and with these, gentle and general friction will be useful. The developement of regenerated temperature should be carefully regarded, and warmer matters may be applied to the trunk of the body, while cooler should be continued to the extremities. This management, however, must be attentively and discriminately conducted, agreeably to the peculiarities of respective instances. The degree of animal warmth restored must be supported and maintained by immersion in aqueous fluids, sufficiently proportioned in their temperature, or coverings, which may answer similar purposes. Dr. Struve thus enumerates, shortly, the symptoms of *Animation suspended, from an intense degree of Cold.* "External Signs. Persons who have thus been deprived of life, will retain the position in which they were when the fatal accident happened; they are commonly found leaning against a tree, or sitting, and manifest the highest degree of coldness; inflexibility of the limbs; the teeth are closed; froth issuing from the mouth; insensibility of irritation; partial mortifications in the extremities, which sometimes drop from the body."

CLI. C. A. Struve makes the following remarks on *Apparent Death by Cold.* "External warmth must not be applied till the internal warmth of the body be excited; and even then, in regular proportion to the gradual increase of the latter. *First treatment:* 1. The resuscitative process should be performed in the open air, or in a cold room. 2. The body should be cautiously carried, without delay, to the nearest house. 3. During removal, and the whole process, the body should be kept somewhat erect, with the head turned a little towards the right side. 4. The subject is to be carefully undressed.—

N. B. Violent treatment ought to be guarded against, such as the immoderate friction and bending of the limbs, by which dislocations and fractures may be occasioned. *Means of exciting Internal Warmth:* 1. The whole body, except the face, is to be closely covered with a layer of snow, half a yard thick. 2. Application of cold water mingled with ice. 3. Clothes dipped in cold water, and applied to the breast and head. *Stimulants:* 1. Gentle friction, (gradually increased,) with clothes dipped in cold water, or with soft brushes. 2. The shower bath and friction should be, alternately, applied. After having continued this method for a considerable time, the body must be left undisturbed for a few minutes. 3. Clysters, of five or six ounces of brandy, into the anus. *Remedies to be applied on the return of Life:* N. B. The application of warm fomentations may now be discontinued; and the resuscitative process pursued in a cold apartment. 1. Stronger friction, cautiously performed. 2. The patient placed in a bed between two persons, in order to promote warmth. 3. Wine, vinegar, or oil, should be externally applied. 4. Emollient clysters. 5. When the patient is able to swallow, tea, with vinegar or wine, should be administered. *Resuscitatives to be applied only in desperate cases:* 1. Venesection. 2. The earth-bath. 3. Introduction of air into the lungs. 4. Electricity." A particular description of the management and application of the different remedies commended, or even which might be serviceable, in the several examples of accidents occurring from the operation of *cold,* would here be out of place, and require extensive examination. It is expected, that all practitioners, who undertake the medical charge of their fellow creatures, in situations where they may be obnoxious to such casualties, be suitably prepared for the most appropriate administration.

CLII. Seafaring people, and especially in the inclement latitudes, and even in the more rigorous seasons of those which are commonly temperate, have undergone distressing hardships and calamities from the influence of low temperature. Mariners have been rigidly affixed to the cordage! and thus rendered monuments of its deadly operation. In exposure of this unfavourable description, every precaution in the way of clothing, and especially in properly defending the different extremities, is peculiarly important, and, if suitably managed, will be powerfully serviceable in their preservation. The exposure of a ship's company, in such trying times, naturally requires discriminate management. When severe degrees of cold take place, they should not be allowed to be loitering, or inactively suspended from some moderate exercise; and this advice is particularly applicable, if there is any considerable atmospheric dampness. The performance of something commanding considerable bodily movement, is undoubtedly adviseable. This moderate employment, ambulation, for example, is beneficial for continuing and maintaining a requisite equability of circulation, by which the propagation of the temperature is encouraged: and thus it constitutes one of the most efficacious preservatives from the destructive operation of cold. This diminution of heat, or, *alio verbo*, cold, is perpetually and collaterally influenced, in its hurtful effects, by the presence or absence of moisture. A combination of coldness and dampness is often extremely prejudicial; and this conclusion is more particularly and extensively applicable to the variable climates. As formerly observed, in the marine tropical latitudes, the presence of moisture (at least if the thermometer does not descend below 75° or 70°,) is, perhaps, not so commonly injurious. And these inconvenient consequences generally originate from the inattention or imprudence of the men themselves. Inconsiderate exposure, such as lying on a damp or wet deck, has frequently, and will, hereafter, cause diversified mischiefs. In the completely healthful, however, in these climates, any uneasinesses from these circumstances are not so remarkably troublesome. The explication of this universally applicable proposition, is collectible from the previously enumerated circumstances.

CLIII. And so far these confessedly unconnected, irregular, and abbreviated observations, concerning the extremes of atmospheric temperature, from the most elevated to the most depressed in which mankind are supposed to be commonly subsisting, or rather which they are physically capable of withstanding. These distant extremes have been considered in their most extensive and peculiar operations, from the augmented and concentrated influence of insolation, "rapidive potentia solis acrior," producing, from incautious exposure to its forceful incidence, headache, languor, &c. or excitement of vascular action, ultimately terminating in dangerous disorder, or death instantaneous. And also, oppositely, to diminution of temperature (cold, relatively considered); "aut Boreæ penetrabile [penetrans] frigus adurat," which is an abatement of the intenseness of the former, also producing diseased conditions from the slightest deviation of healthy quality, to the detriment, or even gangrene of a particular member, or the impending destruction of the constitution.

CLIV. The gradations, intermedial proportions, and remarkably irregular vicissitudes, subsisting betwixt these foresaid extremes, are very important; as they are frequently unexpected in their occurrence, rigorous in their operation, and, therefore, have extensive influence upon those exposed to their impression. These sudden, and, consequently, often unforeseen mutations of the weather—the "cœli temperies"—appear occasionally in all regions and climates; but, as said before, more especially in the northern and southern latitudes, or those which are vulgarly denominated the changeable. The mutability of these, indeed, has been observeable, and considered as an object of importance, ever since they came to be inhabited by mankind. The extreme warmness of the summer in particular territories, and the severe coldness of the winter, and the variableness, &c. of the other seasons, have been long experienced respectively. North America, Russia, &c. &c. are particular illustrations of these circumstances. And, unless the natives were originally accustomed, or even habituated to them, they would be still more disagreeably incommoded by these irregular alternations.

"———medios cum Sol accenderit æstus,
Cum sitiunt herbæ, et pecori jam gratior umbra est;
———glebasque jacentes
Pulverulenta coquat maturis solibus æstas."

" Rura gelu tùm claudit hyems.———
Semper hyems, semper spirantes frigora Cauri.
Tùm Sol pallentes haud unquam discutit umbras,
Et cum tristis hyems etiam nunc frigore saxa
Rumperet, et glacie cursus frænaret aquarum."

CLV. These irregular changes, when they do happen in tropical climates, are particularly remarkable when there are mountains contiguous, or in situations influenced by the coldness or changeable state of temperature, so commonly happening in their neighbourhood. The naturalized inhabitants —who are, therefore, in possession of a systematic capability qualifying them for the endurance of these circumstances; and some of whom, (the Chinese forming a notable instance,) by precautionary contrivances, and principally in the appropriate employment of their habiliments—withstand these with comparative less inconvenience. A stranger, on the other hand, and, particularly, if he is inattentive or not forewarned, and, what too often happens with common seamen, who are unprovided with necessaries, frequently are rendered the subjects of lingering illness. Sailors often suffer diversified and anomalous ills, from careless and indiscreet exposure. For example, by reclining on a damp deck, they are occasionally seized with lumbago, or with painful affections of the glutæi muscles, or the tensor vaginæ femoris, or about the shoulders; these being points by which they are chiefly supported in the recumbent posture. Different examples of otalgia have been known to be produced in this manner. But evils of a more extensive and important description are sometimes the consequences. Affections of the intestines,(and some organs communicating,) and such as diarrhœa, dysentery, cholera, threatenings of hepatitis, or, perhaps, more commonly of congestion of the liver, are a few of these consequential inconveniencies.

CLVI. A frequent diversity of weather is, very generally, observeable to voyagers while passing through the different channels or straits; and must be familiar to all who have been accustomed to the Indian or Chinese seas, &c. These alterations of weather, which are oftentimes precipitant, and, on that account, occasionally not anticipated, are constantly in respective connexion with augmentation and diminution of temperature; the first, indeed, constitutes one of the principal causes of unequal and squally weather; and the latter, a necessary concomitant. In these channels, and other places influenced by adjacent lands, islands, for example, plentiful quantities of nocturnal moisture, and repeated showers, are frequent causes of annoyance. Those who have been labouring smartly in the day, or exposed much to the sun's heat, and afterwards, as too often happens, recline themselves on the upper deck, or elsewhere, in the night, are sometimes sufferers through their imprudent management. But so much has already been said upon the general nature of these circumstances, that here they hardly require any additional consideration. These squalls are frequently preceded by distressing elevations of temperature; and often an immediately consequent decrease is thus the more distinctly perceptible. The wetting received upon these occasions, is, for the most part, speedily evaporated; and thereby, amongst the healthy, commonly produces no disagreeable, sometimes rather acceptable sensations; but, now and then, unpleasant chilliness, &c. may be the consequences. The subsidence of the quicksilver, in these occurrences, is very rarely considerable—most ordinarily from 2° to 5° of Fahrenheit—and particularly at sea, when uninfluenced by the mountains, &c. or other terrestrial communications. But, when the subsequent evaporation from the corporeal surface is taken into account, the difference may actually be greater; the positive amount, perhaps, equalling 8° or 10° of diminution of temperature. This alteration, which, as formerly suggested, is much more ungrateful, in proportion to the highness of the temperature instantly preceding, may, in some constitutions, be productive of mischievous consequences. The frigeration of the surface is too hastily induced, and the circulation undergoes an important difference in its distribution. In imperfect constitutions, and especially in those occupied with visceral disorders, (even although they formerly have scarcely been suspected,) or in those who have these complaints only suspended in the evidence of their action, but not perfectly removed, are thus often reproduced; or even distempers, possessing new characters, may be enkindled. From this accidental or unavoidable cooling, in all its relations and effects, these men often receive injury, according to their respective powers of resisting such impressions.

CLVII. Seamen are, occasionally, exposed to the operation of the dampness so commonly prevailing in swampy or other lowly situated places. The humidity and vapours gradually exhaled in the day, and communicated to the lower part of the atmosphere, are again continuing the nocturnal coolness, condensed and deposited in the form of moisture, or vasicular vapour. This circumstance is particularly remarkable at the commencement of dryness, after much rain or protracted wetness, or even dampness of the atmosphere. The evaporation is regulated, in its quickness or slowness, &c. by the expanse and qualities of moistened surface, the degree of caloric operating, and the actual state of the atmosphere, &c. The subsequent nocturnal deposition, and especially when the atmosphere is nearly, or altogether undisturbed, will generally be proportionate to the comparative difference of the diurnal and nightly temperature; but, in these circumstances, there is often an unaccountable disproportion and dissimilarity. After a hot day, sailors, or others in the warmer climes, are more inclined to careless exposure; and, if the nocturnal coolness be considerable, the probability of subjunctive inconvenience is thereby considerably heightened. These people, therefore, unless their attendance, &c. are pointedly necessary, ought to continue under coverture; or, if requisitely retainable in full exposure, the performance of some moderate movement, will commonly be adviseable.

CLVIII. From a careful and industrious examination of the diversified, but frequently indefinable inequalities of temperature, &c.—as modified, in some measure, by the physical properties of territories and particular localities—a tolerable knowledge of the prodigious influence of the variously occurring conditions of the atmosphere, &c. may be established. The inclusion of the operation of the manifold substances, either conjoined, intermixed, or suspended in the circumambient air, is not, perhaps, of much explicable importance: they are, literally and honestly speaking, so uncertain in their natures, numbers, quantities, qualities, &c. as to be often inappretiable and inexplicable by the most sagaciously inquisitive. An insidious, invisible, and too often unsuspected excitement of distempers, are the pernicious effluvia engendered in unhealthy places, and then propagated in their immediate neighbourhood; for, very fortunately, their malign influence is not very extensively disseminated. And happily (it may again be said,) for mankind, these exhalations are not extensively diffusible, in possession of their deleterious influence; they soon become so much diminished in their virulence, as to be incapable of producing their customary effects upon the human constitution. These circumstances are often troublesome and prejudicial to seafaring people and others, when improperly exposed upon the confines of some districts or islands, and if they are placed in the course of a regular trade-wind, especially to leeward, and in the close vicinity of marshes, in any situation whatever. These misfortunes, therefore, are occasionally remediable, or susceptible of prevention, by appropriate forethought and management; or, if the mischief has commenced, it is removeable by a change of anchorage. This is a consideration of remarkable importance, and, where inconvenient consequences may be anticipated, should never be overlooked. From peculiarity of circumstances, these evils, without the requisite precautions, may not otherways be avoidable. In tropical latitudes, and, occasionally, in the changeable, some anchorages are so under the governance of the trade-winds, that, if they are contiguous to morasses, &c. the miasmata naturally proceeding from them, may be injuriously communicated. When, from an incontrollable concomitance of circumstances, the anchorage must continue to leeward of the island, &c. the intended and desireable purpose is obtainable, by casting anchor at a sufficient distance. The peculiarly and ordinarily perceptible influence of these miasmata, is, fortunately, not efficiently communicated far from the place of their generation and evolution. A distance of two English miles, or even less, will, almost continually, incapacitate their specifical operation, or perceptible communication. This method is the only practicable precaution, in those harbours, which are periodically subjected to the land and marine breeze; and in those in which the trade-wind, or monsoon, commonly blows for six months in one course, and then assumes a contrary direction. These matters must be all managed from a topographical knowledge; and, from the extensive exploration and intercourse of commercial navigation, this acquaintance seems to be obtainable. All commanders and others responsible for their ships' companies, should be in possession of the necessary knowledge. These abbreviated observations, already propounded, will constitute instructions and regulations for those occupied in harbours, or the confines of islands and continents.

CLIX. The pureness of the air, as formerly pointedly remarked, is eminently necessary to the preservation of health, and even of tolerable comfort and happiness. It is salutarily conducive to corporeal soundness and firmness, and thus, indirectly but efficiently conducive to mental serenity and vigour. The impurity of the atmosphere, contrarily, again, is the frequent invisible, and, therefore, not discoverable cause, and fruitful fountain of manifold anomalous symptoms, and also of multiform and important complaints. On shipboard, these consequences have been repeatedly and extensively destructive. These effects, too, may be subsisting in all conceivable proportions,—from the slightest unpleasant impression, or stomachic sickness, to almost immediate extinction of the common living principle. This aggregated efficiency, will even be observeable in its influence upon the most healthful, but previously unaccustomed to the force of such unfavourable circumstances. The continuation of the natural and proper proportion (about one to four,) of the oxygenous principle, is absolutely necessary both to vegetable and animal existence: the oxygene and thanatode, however, must exist in these naturally suitable proportions, (or at least approaching thereunto,) to accommodate, conveniently and successfully, the purposes of respiration. A diminution of the oxygene is commonly attended with less or more inconvenience, or succeeded by disagreeable consequences. In proportion to the increment or decrease of either of these elementary atmospheric ingredients, relative alterations are generally induced in those who depend upon the compound for the ordinary excitement of the principle of animation.

CLX. Although these two aerial bodies have been separately examined, yet no clear notion of their actual relation and condition, in the state of combination, has been hitherto obtained. The properties of the compound, however, are absolutely dissimilar to those of either of the constituents. No satisfactory conclusions, therefore, regarding the compound, are deriveable from an analytical knowledge of its two essentially appropriate components. In the processes of vegetation and respiration, &c. it is continually undergoing decomposition; there is, in one place or other, an unintermitted transmutation of the intermutual qualification of its ingredients, and, also, the uninterrupted transmission of the exhalations of vaporiferous substances into the atmosphere. And, again, there is a precipitation of multifarious substances, from this aerial ocean, upon the earth's surface. Although these operations are continually going on, nevertheless, the quantities of these absolutely requisite components, are, happily, in a ratio approaching invariability.

CLXI. Diversified substances, which are generally supposed to have harmful or dangerous properties, are frequently intermixed with the atmosphere. As more particularly appertaining to considerations about prophylactic administration, the corporeal miasmata, occasionally engendered amongst people, improperly accumulated, or too closely congregated, may here be comprehended. On these occasions, harmful quantities of carbonate of oxygene, and carburetted hydrogene, are unhappily and injuriously disengaged, and become operative. The proportion of oxygene is materially diminished, or, more accurately speaking, incorporated in new compounds; by which its beneficial properties are turned into mischievous, and, in this accidental combination, is now, instead of being subservient to the maintenance of life, perhaps productive of indisposition or destruction. A redundant and noxious quantity of nitrogene is let loose, and thus adds considerably to the general misfortune. The formation of carbonic acid is one of the prejudicial occurrences: in crowded meetings this is evolved in large quantities; and, from its comparative specific gravity, it occupies the lower range of confined apartments. This is a consideration of remarkable importance, as applicable to the lower decks of ships, when, from the nature of the weather, they cannot be thoroughly ventilated, and to prisons, or other places of confinement. In these circumstances, complicated aggravations are ordinarily mischievous. The consequences occasionally superinduced, in unsuitably aggregated assemblages, are exemplifications of some of these inconveniencies. Notwithstanding that distempers, expressively so characterized, may not necessarily and immediately be produced, still numberless anomalous symptoms are frequently troublesome. The dreadful effects of the unnatural accumulation of human beings in the Black Hole at Calcutta, are a melancholy illustration of what may happen, from aggregation, and closeness, and confinement, and the consequential inquination of their atmosphere. These appear to be the ordinary principles: particular and detailed discussion is deemed unnecessary.

CLXII. The lessening of the oxygene is, perhaps, the most ordinary and mischievous occurrence; and, as this is commonly introduced by causes which are confined in their operation, they are, fortunately, therefore, susceptible of hinderance by due attention to circumstances. Diminution (at least in its naturally sensible properties,) of this essentially necessary ingredient, is occasionally induced by physical evolutions, which are not, hitherto, perfectly understood. Combustion, respiration, and perspiration, in crowded assemblies, or in places too confined, conspire wonderfully to the defilement and debasement of the air more immediately circumambient. As formerly mentioned, a circumstance invariably prevailing, when the common air is decomposed in the process of respiration, is the formation of carbonic acid, and which, when allowed to accumulate, has such a deleterious influence upon breathing animals. But what is singular and unexpected, (and what would appear to prove—" that no great deterioration of the atmosphere, from natural processes, is to be expected,) is the result said to be established by numerous experiments, that little variation of the atmosphere can be discovered, even where it is exposed to causes whereby its composition would be supposed to be affected. Humboldt and Gay Lussac found, that the air in a crowded theatre was scarcely altered, after three hours, in its composition, the proportion of oxygene being from 20.2 to 20.4, while that of the atmosphere was 21. Seguin likewise, in submitting the air of the wards of hospitals to trial, which had been kept shut for twelve hours, and which had an insupportable odour, found it nearly as pure as atmospheric air. And Fontana had obtained the same result. This proves, that any change in the constitution of the atmosphere, is quickly removed by its great mobility, and the diffusibility of its constituent gases; and the noxious qualities of confined or vitiated air, must be referred to the presence of effluvia, not discoverable by chemical trials. The insalubrious quality of the atmosphere, in particular situations, must be ascribed to a similar cause."

CLXIII. In places unduly crowded, and especially when ventilation, or the admission of fresh air, is neglected, or culpably disregarded, the oxygene is largely and rapidly expended, and the evil thus participates of a complicated aggravation, and which is perpetually progressive. A great quantity of carbonate of oxygene, and liberated azote, become predominant; and, in proportion to their confinement and concentration, they are so much the more prejudicial. The other circumstances too, lately particularized, become effective, and individually or collectively contribute to additional inquination. The misfortunes of these situations are multiplicate; it is not one circumstance, but a heterogeneous accumulation, which forms the potentia lædens—the productive cause of the inconveniencies. The temperature of the air, in this unnatural confinement, is also augmented, and also the superficial transpiration; and thus, the surrounding air becomes more and more contaminated with the effluvia from the general surface, and bronchia, and is thus farther disqualified for answering the purposes of respiration. Upon a prolongation of this exposure, irksome sensations are produced; an universal perception of languor, relaxation, impaired resolution and capability, drowsiness, &c. &c. are commonly remarkable. The external instruments of feeling, are occasionally the internuncii of uncommon or unwonted, illusive, and, sometimes, swiftly evanescent perceptions. Headache, or a sensation of fulness and distension, or lightness at the sensorium, giddiness, tinnitus aurium; scintillatio, or sparkling, with some degree of irritation, pruritus titillation, &c. of the eyes, &c. The tongue becomes clammy, the faculty of taste depraved; and in the windpipe, but more pointedly in the larynx, there is a sensation of less or more irritation: there is sometimes a feeling of roughness, dryness, coarctation or straitness. Respiration becomes more frequent, but more imperfect or incomplete in its performance; and, in the thorax, there may be the feeling of hollowness or emptiness. The portion of air inhaled, does not give the accustomed and desireable distending and supporting impulsion; and, even although continuing respiration, the person may have a perception of fulness or unpleasant turgescence, sometimes of sinking or lowness, in the space naturally occupied by the pulmonary apparatus. This feeling is the cause of anxiety, and alarms the sufferer with the conception of approaching dissolution. At the region of the stomach, or, generally, in the epigastrium or præcordia, there are commonly feelings of gravitation or heaviness, of sickness, occasionally of voidness, or sometimes of sluggish irksome fulness, of weariness,—and, when the cause is continued, these disagreeable perceptions are succeeded by distressing and threatening faintness. The faculty of thought is sometimes confused, indistinct or imperfect, occasionally embarrassed or interrupted; and the stadium of the thinking operation, instantly or immediately preceding the transient obscuration, difficultly reconvened; and, sometimes, the conception of the subject formerly occupying the attention, is completely obliterated. Arterial pulsation generally becomes more frequent, but enfeebled; and the person may now have the semblance of one in the more advanced progress of febrile affection. These circumstances and appearances may be liable to great difference and variegation; in their conjunction, intenseness, &c. they may be very dissimilarly characterized and represented, in different individuals. They may be liable to indeterminable complication, comparative gentleness or aggravation, according to the nature or state of the constitution, the continuance, the severeness, &c. of the unfavourable circumstances.

CLXIV. A determinate, but not directly mortal exposure, is frequently succeeded by febrile distempers, and these may afterwards be either more commonly or confinedly observeable. By injudicious accumulation and concentration, which are frequently the consequences of carelessness and mismanagement, these mischiefs gradually acquire the power of communicating to others, distempers having their own specifical and expressive characters. And, in this manner, in the former periods of navigation, severe and devastating complaints have been extensively and lamentably disseminated. These misfortunes, it is sufficiently understood, may happen in any place, through inattention, dirtiness, crowding, and disregard of ventilation. The truth is, that these circumstances (until within these few last years,) have been too often operative on shipboard. They commence more especially when the different apertures convenient for the admission of pure air, have been for some time obstructed; and hence, frequently, originate the grievous mischiefs which have been so common in the smaller and closer vessels. These inconveniencies, however, from the improved construction, largeness, and arrangements of modern vessels, are now, very fortunately for navigation and commerce, rarely troublesome. The occurrence of these evils now-a-days, is, therefore, it is piously hoped, comparatively infrequent; and, when they do occur, are pretty constantly ascribable to some of the lately enumerated and incommoding circumstances.

CLXV. In debilitated or shattered constitutions, this impression of unfavourable circumstances is generally more speedily and seriously exemplified. On shipboard, where, from boisterous weather, there may have been a long closure of all the port-holes, &c. even febrile ailments, possessing a tendency to periodical recurrence, may now become conspicuous. This, however, is most liable to happen, where closeness, dirtiness, and wetness, have prevailed; and this occurrence appears also (as far as personal observation has extended,) to be determinable, at least in some degree, by an inexplicable predisposition of the constitution. Different examples have been seen, in which the writer, by circuitous examination, obtained information, that the patients had been previously subject to these complaints. The information of common sailors and soldiers, is, no doubt, very imperfect; and, what is worse, frequently fallacious, and intentionally sophisticated. But there is a mode of obtaining information, even from these faithless people, which is, at least, supported by probability. —Some of the foregoing observations have been introduced, assignedly, with the view of inculcating, in professional brethren, the love of their duty, and an unweariable perseverance in investigation. It is not unknown, that examples of febrile affections, possessing an intermitting disposition, have become remarkable on shipboard, without the probability of their being produced by any other but the circumstances with which those affected may be more immediately encompassed: and upon discovering the source of the mischief, and correcting or removing it, the distempers, as consequences, have disappeared. This subject will again come under consideration, in the examination of the article of cleanliness.

CLXVI. Variegated and anomalous symptoms, during the aforesaid closeness and confinement, &c. and which are difficultly assignable to any particular description of complaints, will then often be presented to the notice of the medical attendant. This opportunity, also, is frequently and ingeniously employed for the representation of assumptive complaints. The slothful, the deceitful, and the flagitious, embrace the suitableness of circumstances for practising their attempts at imposture. A faithful and unremitted attention to the requisite admission of undefiled air, to every internal part of a ship, is a consideration of the highest importance for preserving the health of those employed for marine service. There is no other contrivance comparable to this— none of equivalent importance. It is inimitably beneficial in maintaining health, comfort, strength, and animation. And it is also the most efficacious prophylactic, and even a very powerful application in the removal of mischievous distempers, already subsisting or prevailing. The neglecting or disregarding the introduction of pure air, has frequently been the cause of extensive evil, and even the production of different maladies; and also been the fruitful original of an inexcuseable exasperation of accompanying disagreeable circumstances. A prolongation of this inquisition appears here unnecessary, and may, perhaps, be resumed at some other opportunity.

CONCLUSION.

CLXVII. The antecedent observations contain an irregular and shortened account of some of the principal circumstances of the atmosphere, with some of their peculiarities, having a more significant importance, as applicable to mankind; and more particularly to this subdivision of the undertaking.

Some general remarks upon it have been supplied, containing occasional observations, as suggested by the ancients. This was attempted in a manner somewhat curtailed, simply and concisely to commend and impress the needful attention to a subject naturally of the greatest moment, by arguments deducible from the venerable information, and practical memoranda, of the physicians and other respectable philosophers of antiquity. These were, generally speaking, possessed of an uncommon acuteness, and were, also, persevering and faithful inspectors of physical operations and evolutions. The composition of the atmosphere, as determinable by the most improved observations and experiments, has been carefully considered and introduced. The necessity of it for supporting the vegetable and animal kingdoms, &c. has been transiently illustrated. It has been explained to be—the exclusive and universal intermedium for conveying the influence of caloric, although the peculiarity of the movement of it through the atmosphere, from its original and unfailing fountain, the Sun, and without perceptibly imparting its calefacient virtue, is altogether inexplicable. And through it, also, are light, electricity, and manifold other anonymous substances, regularly transmitted. The electrical power may be considered as always subsisting in the atmosphere, but only occasionally displaying itself in its wonderful and powerful operations. A general supposition is, that an intimate connexion subsists betwixt this agent, and those of light and caloric. They are, however, susceptible of distinction, only in their more ordinary characters and operations, but not in their radically separate attributes and properties. In the air are suspended clouds, vapours, &c. and diversified substances, comminuted to an incredible degree of subtility or fineness. The examination of many circumstances, however, it may be observed, has been intentionally omitted, as not constituting objects deserving attention, in a tractate of this description.

CLXVIII. The unequable and frequently fluctuating degree of caloric contained in the atmosphere, has, moreover, been taken into consideration. The moisture, or aqueous vapour, and several other exhalations, have been, severally, subjects engaging attention. The voyager, too, has travelled from his native country, and proceeded betwixt the tropics, or elsewhere, and been exposed to increments of temperature, with all its disagreeable, and sometimes mischievous impressions; and which are almost constantly aggravated by the concomitant particularity of circumstances. These things are to him, if an unaccustomed adventurer, unpleasant and inconvenient. The most common effects of their operation have been compendiously, and therefore, perhaps, imperfectly and unintelligibly investigated. He has also been presented, in the several situations in which he may be placed, in the currency of a voyage from Britain to Indian climates. And here it may be remarked, as a subject deserving the marine surgeon's attention, that, in the course of such a voyage, he may be exposed to a difference of temperature, varying from 20° to 90°, or more, of Fahrenheit's thermometer. Agreeable to this proposition, it is easily understood, that an allowance for the time of departure and recurrence is necessarily included. The position has been reversed, and the native of tropical climates has been conveyed into the cooler regions, in which he may unavoidably be exposed to the operation of extensively diminished temperature. This alteration is to him, also, who has been accustomed to the tolerance of the most powerful insolation, the diminution of an experienced and familiarized excitement, which is to be deemed of very considerable importance. He may be exposed to variable gradations, but the depression of the calorific influence is at first almost intolerable, and is, regarding him, to be considered an abatement of part of his physical animation.

CLXIX. The naturally and ordinarily subsisting extremes, or opposite boundaries, of observeable atmospheric temperature, have been designedly first investigated. The intermedial, and frequently alternating rates or graduations, progressive or retrocedent, have been transitorily introduced, and some explicative and beneficially applicable observations thereupon communicated. The scientifically illuminated practitioner, in the management and administration of his professional employment, will carefully remark the circumstances or combination of these which may particularly affect the health of sailors, or others sojourning in foreign climates. Occasional observations upon these things have been interspersed, and commendable admonitions proposed to all those who may superintend, and be, in some measure, answerable for consequences. The languid inactivity of many, when they have obtained their station, is peculiarly blameable, and will constantly lead to something disrespectful, or to degradation; or, what is worse, become injurious to the welfare and common usefulness of those who are so unfortunate as to be under their guidance or discipline. The continually fluctuating nature of many of the things considered in this chapter, will require the attention of the sagacious adequately to comprehend them, and the judgment and determination of the experienced sufficiently to withstand them in all their consequences.

CLXX. The previously enumerated considerations upon the atmosphere, its changeable temperature, whether inclinable to degradation or augmentation, and a thousand other things, evidently and strongly suggest and declare the incessant obligation operating upon practitioners, commanders, &c. to superintend with unfailing observance, and faithful and discerning inspection, the management of those naturally careless and imprudent people, consigned to their assistance and governance. The imprudence and carelessness, the unconcerned disposition, of these men, should, perhaps, be seldom employed against them, as arguments excluding favourable and protecting treatment. They too often require admonition, instruction, or even compulsion, for the convenient performance of their personally applicable management. This proposal may sometimes bear the semblance or appearance of an ungracious or even unprofitable undertaking; but, to the considerate and intelligent, this tenderness or compassion, this honourable kindness, will not seem altogether irrelevant.

CLXXI. The astonishing difference and uncertainty of climates, generally so considered, and other concomitants to which they are necessarily exposed, require a suitable distinction of their respective constitutions and durabilities, proportionate management of their exposure, &c. The distinguishing and conscientious practitioner, and all officers, will therefore regulate, with discerning ingenuity and propriety, the respective capacities, &c. of those who, perhaps, have not, heretofore, been accustomed to such exposure, until the influence of habitude be confirmed and established. The person, therefore, recently imported from a frigid to a tropical climate, is not so equally prepared for the endurance of its scorching operation, as the one who has before undergone the force of these circumstances. His clothing, his dietetical allowance, proportion of employment; and especially his exposure; and still more importantly, if this is prolonged; and every other thing, either necessarily or accidentally connected with him, will be subjects requiring friendly attention. The examination of this department, might have been indefinitely prolonged; but, it is conceived, that enough has been suggested to demonstrate the importance of this subject, and to constitute, if they would condescend, a groundwork to subsequent inquirers, for illustrating a matter so intimately subservient to mankind, both in their common support, and also in the advancement and maintenance of their comparative happiness.

" Novisse oportet āĕres locorum, qui sunt salubres aut pestilentes."

" Sed nos immensum spatiis confecimus æquor,
Et jam tempus equûm fumantia solvere colla."

" O navis, referent in mare te novi
Fluctus: O quid agis? fortiter occupa Portum."

" Qui didicit patriæ quid debeat, et quid amicis."

CHAPTER THIRD.

SOME OBSERVATIONS ON ALIMENTARY SUPPLIES.

"Ad ea veniendum est, quæ nos alunt, id est cibum, et potionem. Hæc autem non omnium tantum morborum, sed etiam secundæ valetudinis communia præsidia sunt. Pertinetque ad rem, omnium proprietates nôsse: primùm, ut sani sciant, quomodo his utantur."

I. A SUBORDINATE, but still absolutely necessary consideration for the maintenance of mankind, is the ministration of alimentary subsistence or sustenance. By this may be understood, all substances either employed for nourishment, or serviceable or applicable to such purposes. This comprehensive classification, therefore, includes nutritive substances, from what region or part soever of Nature's ample kingdom they may be procureable or obtainable. The inevitable and irresistible necessity for nutrimental administration, is universally experienced and understood. The production, nutrition, and support of animals, are some of the most wonderful of ordinarily observeable phænomena. This alimentary allowance must be successive, and never extensively interrupted; if otherways, the consequences would be proportionate to the intervenient circumstances. In civilized countries, three daily meals are generally considered necessary; but the inclination for satisfying appetite is materially regulated by custom. It is seemingly adviseable, that these meals should be equidistant, and have an approaching agreeableness of qualification, both in their more sensible properties, and also in their quantities. It is reasonable to suppose, that this mode contributes, most conveniently and beneficially, to the preservation of the constitution; and the requisite and desireable firmness and durability, will thus be more uniformly and comfortably maintained. The quantity of victuals taken at one time may be less voluminous, and, consequently, the digestive apparatus not so obnoxious to unnecessary and incommoding overcharges. The multifarious, and, consequently, heterogeneous substances, swallowed by voluptuous and corrupted mankind, are almost innumerable, with a perpetually discomposing and insatiable propensity for their augmentation.

——"siccus, inanis
Sperne cibum vilem: nisi Hymettia mella Falerno
Ne biberis diluta."——

——"non in caro nidore voluptas
Summa, sed in teipso est: tu pulmentaria quære sudando."

"Jejunus raró stomachus vulgaria temnit."

II. The conversion of animal and vegetable substances into those possessing apparently absolutely dissimilar figurations, constitutional arrangements, properties, &c. is practicable by the digestive and other transmuting functions of the human stomach, and other organs conducive to assimilation The matters upon which men and other animals are supported, are gradually assimilated and translated into the constituent principles of their own corporeal structure. What an inexplicable transformation it is, for vegetable, or even animal substances, to be naturalized into the constituent composition of a rational creature! All this wonderful alteration, however, is effectuated by the peculiar influence of the stomach, and, subsequently, more diffusively by the constitution; but it is probable, that chemical alterations are, likeways, continually intervening. If this digestive and requisite operation were suspended or enfeebled by any disturbing cause, acting either generally or topically, the performance of nutrimental reparation would, commonly, be disqualified, in a correlative proportion. As just hinted, it is likely that chemical influence also assists, within prescribed boundaries: but an animate principle or property is, for this purpose, continually and needfully subservient; and the relation and respective power of each is completely unknown. An extended examination of the subject is not proposed, nor here can it be considered necessary or serviceable.

III. Any and every person, who has the endowment of sensibility, is, without information imparted, sufficiently acquainted with the unpleasant or painful feelings of hunger and thirst. Nature admonishes her animate offspring by prelusive perceptions, suggesting the propriety of mitigating this periodical recurrence of appetite, by the assumption of nourishing substances. The capability of opposing the impression of hunger, is unequally proportioned in different animals. Some of the voracious and carnivorous can ingulph such prodigious quantities, as to suffice them for a lengthened interval, before the return of urgent hunger. Those animals which are the most capacious, the most vigorous and laboriously employed, generally require a more extensive proportion of victuals than those in contravening circumstances. The necessity and frequency of supplying appetite, is mightily regulated by the influence of custom, especially when confirmed into *habitual* observance. The quantities requisite for suitable nourishment, even of animals of the same class and apparent magnitude, are oftentimes remarkably different. This disparity of the quantity necessary, may be regulated, in different individuals, by almost innumerable circumstances; by depraved custom of swallowing more than needful for nutrition; in this manner, a man, who was originally moderate in his dietetical allowances, may become, imperceptibly, gluttonously inclinable, and ultimately be an ungracious gormandizer. The requisite proportion of nutritive supply will be regulated, also, by the indolence or activity of the respective individuals. These, however, are general rules, and, therefore, liable to manifold exceptions.

IV. Vegetable and animal matters, principally constitute the alimentary supplies of all creatures which are supported by swallowing these substances. Some exclusively subsist upon vegetable, others, again, live more commonly upon animal substances. A multitude, however, it may be observed, employ a variously proportioned combination of these materials for their nourishment. The difference of proportions is also extremely variable; some preferring a large share of animal, others of vegetable substances. The number of these which has been employed by man, in the different countries and ages of the world, surpasses all conception. And many substances have been, and are used, which furnish little or no nourishment; and man particularly is, of all animals, most guilty of this cumbersome, and frequently troublesome impropriety. And, it may be observed, that some alimentary substances, which are acceptable and wholesome to some animals, are to others deleterious. This peculiarity, this constitutional idiosyncrasy, by which the particular impressions of some substances upon animals are destructive, and to others are nutritive and salubrious, is a circumstance, at present, not submissible to any determinate explanation.

v. That the operation of digestion commences in the stomach, has been understood ever since mankind reflected upon their own constitutions, with their multiform and changeable capabilities, and diversified performances. The beginning of digestion has been demonstrated, in those rapacious animals, which endeavour to ingurgitate so copiously, as to be incapable of containing the quantity swallowed altogether in their stomachs. In the rapacious fish, for example, that part of their fellow-creatures which has been transmitted into their tremendous maws, hath been seen in a state of decomposition or dissolution, while that part continuing in their œsophagus, has remained almost or altogether unchanged. The food, then, is naturally conveyed to the stomach, in which the operation of digestion commences. The continuance or stay of the alimentary substances in the stomach, is determinable by a variety of circumstances. This function, in mankind, and, very probably, in all animals, is regulated by the easiness or difficulty of the digestion of the substances in it contained; by the perfection of its structure and capabilities; the harmless or offensive qualities of its contents; by the inactive or the employed condition of the person; by the state of mental operation,—and a numberless accumulation of other influences. Cheerfulness and agreeable employment, are auxiliary to digestion; depression or sorrow are inimical to this necessary operation. This despondence is indirectly productive of the corporeal exhaustion, so commonly attendant upon mental affliction.

VI. A diversity of sentiment has subsisted concerning the efficient causation of digestion. Hippocrates appears to have attributed this peculiar animal function to the influence of heat; and, on this account, considers coldness of the stomach one of the causes of indigestion. This appears to have been one of the earliest conceptions on this subject—the operation of digestion. That after the alimentary substances were transmitted into the stomach, they there underwent an operation somewhat similar to concoction, or boiling. And, therefore, this operation has received, in different languages, an appellation expressive of this fanciful similitude. Galen, &c. employ πεψις, which, as evidently deriveable from πεπτειν, coquere, digerere, &c. is equivalent to the concoctio generally used by the Romans. Celsus, who possessed an intimate knowledge of the language of his country, generally assumes this term to designate the digestive proceeding. It has also been ascribed to contrition, and the forcible and mechanical action of the stomach; to a regulated act of putrefaction; to fermentation; and, latterly and veritably, to the influence of the gastric secretion. This, indeed, appears the genuine and natural agent in the decomposing and synthetical operations constituting digestion. The temperature, however, of the human stomach, seems favourable, and perhaps is contributive, to this vital process. The antiquated conceptions about the functions of digestion, are sufficiently and deservedly disproved and exploded. The ventricle itself prepares a liquid admirably qualified for the purposes of digestion. This stomachic liquid, therefore, is the only powerful promoter of this necessary operation. It does not possess an equal influence upon all the substances which may be forwarded into the stomach. Upon many articles, if the function of digestion is in a healthy condition, its action is almost immediately commenced. Some substances traverse the whole alimentary channel, without apparently undergoing any alteration. Osseous matters are conveniently conquerable by the dog's stomach, and all other animals which are naturally carnivorous or flesh-eating. These substances, by those which principally or exclusively live upon vegetables, are commonly indigestible. This incapability, however, is removeable by their continued employment, and the stomach progressively becomes familiarized to these substances, and conveniently able for their digestion.

VII. The stomach of man, who generally subsists upon a variable proportion of animal and vegetable substances, can scarcely overcome and transmute bony bodies to alimentary properties, suitable to his his own purposes. The goat, the cow, &c. can swallow with impunity, and convert into nutriment, a diversity of vegetables, which to man would prove highly dangerous, or even, commonly, poisonous. The stomach, commonly, acts most vigorously and successfully, when only furnished with a moderate proportion of alimentary substances. The contrary of this happens when it is overloaded; hence the grievous qualms and distresses of the luxurious and ravenous. The remora or delay of the alimentary ingredients in the stomach, is determined by a multiplicity of circumstances. In the same person it is unequal, at different times, proceeding from the quantity, quality, &c. of the victuals swallowed, and the peculiar condition of the functions of digestion.

VIII. It has been ascertained by numerous experiments, instituted by respectable philosophers, and intentionally for the determination of this circumstance, that the gastric juice, as it is ordinarily denominated, is the true cause of digestion. The peculiar nature of this stomachic preparation is altogether unknown. Different inquirers have fruitlessly endeavoured to procure this substance, to determine its peculiar properties; but all these, as might naturally be expected, have been ineffectual. The truth is, it seems impossible to obtain this secretion, disjoined from other substances; which must considerably influence all the conclusions deducible from these investigations, with how much skilfulness or perseverance soever they may have been prosecuted. This secretion acts upon the surface of the different alimentary substances, and appears to form with them an intimate combination. The operation of dissolution is gradually propagated through the whole substances, when they begin to assume an appearance widely different from that which they formerly possessed. The digestion is also materially encouraged and facilitated, by a previously sufficient comminution. The more considerable the fineness or subdivision of the substances employed, so much the more will generally be contributed to the easiness and expedition of the digesting operation. The observation, also, may here be introduced, that all alimentary materials conveyed into the stomach, must undergo a complete alteration of their sensible properties, before they are suitable, or accommodated to the nourishment of the body to which they are in destination. Milk, although seemingly the most agreeably calculated for the nutrition of all animals belonging to the class of mammalia, nevertheless, invariably passes through a change in its apparent properties, before it is transmitted into the channels of nutritive conveyance. The most perceptible alteration of this substance is coagulation in the stomach, &c. although the same fluid, when projected into the intestina crassiora, appears to undergo absorption, without any evident mutation of quality. What applies to this fluid, also appertains to all other substances capable of conversion into the particular structure of the different parts of the human constitution. Gelatina, fibrina, albumen, mucus, &c. although physically constituent ingredients in animal composition, are, notwithstanding, constantly changeable in their arrangement, &c. by this animo-chemical transmutation.

IX. After the food has undergone the requisite alteration in the stomach, it is transmitted into the duodenum; but whether this is performed at intervals, or the whole digested quantity is propelled successively, but leisurably, is not ascertained; but the first supposition is the most probable. Although the alimentary combustibles may have been so far transmuted, in their sensible properties, by the action of the gastric liquor, &c. yet they are not properly prepared for furnishing the necessary nutriment, and for the separation of those materials which are improper, and therefore afterwards, as is well known, evacuated at the different emunctories. In the duodenum, they meet with the bile and fluid prepared by the pancreas, which also produce new alterations. Although the bile and liquor secreted by the pancreas, are not absolutely necessary for the existence of the animal, they are, however, needful for the complete perfection of the nutritious liquid, and for the plumpness, stoutness, and healthiness of the constitution. The particular purposes which the biliary secretion answers, in accomplishing the decomposition of the alimentary substances, has not, or cannot, be satisfactorily investigated nor comprehended. Whatever purposes are incipiently performed by the saliva, are perhaps completed by the liquid forwarded from the pancreas. The concluding alterations upon the food, are probably produced by the combined action of these two liquids. They, most likely, are both decomposed, and a part of their constituents conjoined with the chyle, or liquor of nutritive supply, and another part added to the excremental proportion. This separation of these respective substances, is thus principally effectuated, by the combined influence of the hepatic and pancreatic discharges. The temporal subsistence of mankind depends upon a continual separation and apposition of formative and supporting substances; and this continuance is determinate by impassable boundaries; but apparently postponed or accelerated, lengthened or abbreviated, by irresistible, and what may be called extrinsical impressions and irrestrainable occurrences.

x. A combination of vegetable and animal substances appears best calculated for the nutriment of mankind: upon these, indeed, they are generally maintained; and, according to the goodness or indifference of their absolute properties, the qualifications of their constitutions will, in some degree, be regulated. And this conclusion is applicable to every component particle entering into their structure. There is a very perceptible difference between those feeding almost exclusively upon vegetable substances, and those who live upon a commixture of these and animal materials. The first are commonly of debilitated constitutions, of inferior size, strength, and durability; they are often more pusillanimous, and have less intellectual capability, than those who subsist upon a judiciously proportioned allowance of all these substances. Some nations, impelled by physical necessity, are reported to be maintained by the assistance of a few articles. Arrian mentions the ichthyophagi, or fish-eaters, who inhabited the coast of Mekran or Gadrosia, when Nearchus navigated from the Indus to the Gulph of Persia. Fish of different sorts, dried in the sun, and formed into cakes, were said to constitute their principal subsistence. Strabo mentions an African nation, which he denominates kreôphagi; (literally flesh-eaters,) which evidently implies, that they were, at least, principally fed upon animal substances. Whether they may be considered as the progenitors of those beings who are represented, by Bruce, as feeding on the brinde, or flesh cut, with savage atrocity, from living animals, is not discoverable.

XI. Several nations, on the contrary, live almost wholly on vegetables; but, it may be remarked, that this in general proceeds more from necessity than inclination. This practice is remarked amongst many of the Asiatics at this present time; rice is the article upon which millions of these miserable heathens are almost perpetually supported. Many islanders are chiefly fed on indigenous and spontaneous roots and fruits, and the fish which they obtain upon their own coasts. The inner bark of the fir tree forms a considerable proportion of the food of the Laplander, and some other northern people. The victuals employed by many tribes, inhabitants of Siberian regions, would seem to the delicate and luxurious truly disgusting and abominable. Such a diversity has Nature, in her extensive kingdom, appointed for the maintenance of her rational offspring. Peculiarity of territories, localities, &c imposes an unavoidable particularity in the procuration, allotment, and employment of their alimentary substances.

XII. A conspicuous difference, it has been said, prevails betwixt those who live almost entirely upon animal, and those who are almost completely nourished upon vegetable substances. What a remarkable discrepancy betwixt the carnivorous inhabitants of the southern American continent, and the Asiatic oryzophagi. The carnivorous are commonly irascible, vindictive, treacherous, and sanguinary; while the granivorous are more temperate, not so vengeful, not so perfidious, not so inclinable to bloodshed. Numberless arguments might be suggested, declarative of the inexplicable modification of constitution, introduced by the particular properties of the food which is constantly employed. This adventitious constitutional qualification, may not appear in such force as to regulate the figuration, and the other more peculiarly inseparable characteristics of the individual; however, this circumstance does not invalidate the supposition, or, what is more, the confirmation of this occurrence. The supposition of this gradually engendered peculiarity is admissible, of what description soever the food used may be; and if its wholesome properties are impaired or degenerated, particularities of an unnatural appearance may become remarkable to the eye of discernment. And thus, the very articles employed for the nourishment of man, are frequently the productive causes of indisposition. The speediness of the effects, and also their phænomena and importance, will be greatly affected by the inconceivable dissimilitude and disproportion of respective constitutions. This is oftentimes exemplified and illustrated in those who possess a sufficiency of salubrious provisions, and those seafaring people, for instance, who are too frequently obnoxious to opposite circumstances. Aliment, therefore, may, as it is ordinarily used, be considered, when transformed by the processes of digestion, assimilation, &c. as the materially constituent principles of the animal; it is, on this account alone, a matter of the most essential importance in the management of the practicable preservation of seamen's healthiness.

XIII. In the primeval state of mankind, the articles used for sustenance, it may be said, were procureable, almost exclusively, from the vegetable kingdom. They were apparently and principally obtainable from the fructiferous and graniferous vegetables. From this, however, it is perhaps not reasonable nor allowable to conclude, that the longevity of the antedeluvians solely depended upon the properties, preparation, and employment of their sustenance.

This longevity must have commenced and originated from a primordial constitutional qualification, unalterable by the ordinary physical circumstances to which they might be exposable. Authentic declaration communicates the intelligence, that vegetable nourishment principally supplied the venerable patriarchs, for many centuries preceding the Noachian inundation. Shortly after this eventful catastrophe, aliment obtainable, and prepared from animals, was permitted and generally employed. This allowance or sufferance, was introduced with the precaution of particular limitations and regulations. They were circumscribed, and, at same time, authorized by ceremonial ordinations and religious injunctions. Their unaffected simplicity—the plentiful presentation of the excellent fruitage, and grains, and roots, peculiarly indigenous in the temperate and productive latitudes, in which, it is allowable to conclude, they were originally placed, were surely principal considerations to determine them to the employment of these substances.

> " ———the food of Man
> While yet he liv'd in innocence, and told
> A length of golden years; unflesh'd in blood,
> A stranger to the savage arts of life,
> Death, rapine, carnage, surfeit, and disease;
> The lord, and not the tyrant, of the world."

XIV. The natives of the warmer climates employ, almost uniformly, a much larger proportion of vegetable substances, than those of the colder countries. And this is a fortunate and beneficial custom and practice, impressed upon the attention of many of the former people, by the concurrence of two or three administering circumstances; these are—necessity, from the scarceness of suitable animal materials, or an interdiction of these, sometimes with specifical and prescribed indulgences, by ceremonial prohibition, and regulating determination, attainable from the most infallible of all instructors—experience. This latter, by declaring the inconvenient consequences of its inordinate use, must, where reason governs, operate as a powerful and satisfactory dissuasive.

xv. The propriety and necessity of a particular and determinate method, in dietetical allowance and ministration, were confessed and considered by the ancients with much attention. The management of it, indeed, was, by them, deemed of such remarkable importance, that it constituted, amongst the primitive physicians, the principal medicinal application. As the Æsculapian profession gradually gained some acquisition of knowledge, and rationality of principles—as its declarative efficiency became more intelligible, and manageable, and appropriate—so, in like manner, proportionally to the knowledge of those times, alimentary exhibition was considered as a particular department, and emphatically denominated Diaitêtikê. The illustrious physician of Côs has transmitted diversified instructions and regulations, concerning this important subject, in various parts of the writings to him attributed. Previously to his time, articles of a dietetic nature were the remedies most commonly administered. A careful attention to, and observance of, the several efforts of nature, and the exhibition of different substances belonging to this department, and these principally from the vegetable kingdom, were esteemed the most beneficial or essential constituents in their curative exhibitions. The prevention, the abatement, or moderation and cure of distempers, were professedly attempted by the adhibition of alimentary materials. Medicinal substances, strictly so named, at this period, constituted a very inconsiderable proportion of the physician's apparatus. The different supposed, or genuine operations of these, would, it is presumed, be carefully considered, and even subjected to examination. A careful inspection of the writings of the ancients, will communicate some information of the importance and extensive influence which they conceived to be in the atmosphere, and in the alimentary substances; and, as they were judged beneficial in the preservation of healthiness, or prejudicial in the excitement of numberless complaints.

XVI. These observations are not theoretical or speculative, nor traditional; they are supported by undeniable, by scriptory testimony. "Principio sanè neque inventa fuisset, neque investigata ars medica, neque enim ea ægrotis opus esset, si eadem victûs ratio iis offeretur, qua qui valent utuntur. Triticum igitur macerantes et omnino pinsentes, molis frangentes, cribrantes, subigentes, et assantes, panem confecerunt. Ex hordeo vero mazam, et plurima alia magna circa eam adhibita opera coxerunt, assarunt, miscuerunt, valentiaque et intemperata cum imbecillibus temperantes, omnia pro hominis natura et viribus composuêre. Qui a natura superarentur, alimentum incrementum et sanitatem præstare. Huic autem invento quodnam justius aut convenientiùs quam medicinæ nomen imponi queat?" &c. Celsus enumerates, particularly, a multitudinous stock of substances, and institutes a comparison among them, conformably to his judgment, of their respective properties. He first considers them more immediately as dietetical substances, and then as medicinally applicable. The moderns will, most probably, not coincide with him in his classification of "panis fermentatus inter ea" scilicit "aliena verò stomacho sunt." The historian will furnish evidence, how mankind, in the different regions of the earth, are naturally supplied with the articles which they commonly use for their subsistence. One part almost totally supported upon vegetable matters, another nearly or wholly upon the remains of animals, and a third upon a promiscuous and fluctuating proportion of these substances.

XVII. These disquisitions show, that if the ancients depended so pointedly upon the properties, preparation, regulation, and administration of dietetic articles, certainly it is very reasonable to bestow attention upon this subject, for the common benefit of mankind. And may it not be suggested and inculcated, more especially for the advantage of those unfortunate fellows who are unpleasantly confined to the unfriendly and troublesome circumstances of shipboard. It appears unnecessary to enumerate and give a description of every substance, which is, or may be administered for the purposes of nourishment. This would require such an extensive and elaborate discussion, as to be completely inconsistent with this undertaking. The principal observations, therefore, will have a reference to those alimentary materials, which are commonly supplied for the use of seamen. These too, from an unavoidable conglomeration of circumstances, are very commonly confined to a moderate number; and these, moreover, are ordinarily in a particular condition of preservation. The animal matters, more especially, are prepared with different sorts of condiments. The substances most generally, and, perhaps, most effectually employed for this purpose, are muriate of soda, or sea salt; nitrate of lixive, or saltpetre; sugar, vinegar, &c.

XVIII. Numerous methods of arranging alimentary substances, for the conveniency of description, might be proposed; but, as distinctness and usefulness are here highly commendable, the subject, therefore, shall not be embarrassed with unprofitable fractional subdivisions. A moderate attention to the following arrangement, will, probably, make this department more conveniently and familiarly intelligible. 1st. Substances, more peculiarly designated alimentary, and commonly possessing different gradations of solidity and firmness, according to the varying condition of many accompanying circumstances. These, from the comprehensive largeness of the definition, may either be of a vegetable or animal nature; or, they may have these properties in combination. 2d. The different liquors, or liquids, continually requisite for the purpose of dilution, and the perpetual substitution of the unceasing dissipation of animal humidity. These fluids are directly obtained and employed, either as naturally furnished, or as they may have been modified by artificial and chemical operation and influence.

XIX. A few principal articles only, of the first division, are customarily obtainable by seafaring people. The difficulty, or rather, unfortunately, the impossibility of supplying a sufficient assortment of flesh unsalted, imposes the necessity of furnishing it in an opposite condition. In prolonged voyages and

and tedious cruises, especially, this, with other causes, are frequently productive of numerous mischiefs. Navigation, in the ages of antiquity, was so constrained within moderate boundaries, that there is hardly any description of any particular distempers, to which they might be more particularly obnoxious. The deficiency of knowledge and instruments, suggested to them the propriety of keeping by the coast, in all their aquatic excursions. The construction of their ships, also, was ill calculated for the stowage of water, or other necessary provisions; and, on that account, they were occasionally procured from the shores along which their course was extended. It appears, that they commonly and designedly depended upon these occasional supplies, which they would casually receive at their different anchorages. After the extensive diffusion of navigation, in the fourteenth and subsequent centuries; the destruction committed amongst seafaring people was dreadful and lamentable. Their alimentary supplies were in a miserable state of preservation; frequently in the state of decomposition and putrefaction; and these, accompanied with closeness, dirtiness, and every other conceivable imperfection, were conjointly and powerfully operative in the excitement and maintenance of these inauspicious misfortunes.

xx. Britannia's navigation and commerce, which inconceivably overbalance all performances of this description, and which will continue, it is truly hoped, interminably unparalleled, has also experienced some of these afflictive and disastrous consequences. The successive observations performed in different countries and climates, &c. upon the hurtful effects caused by inattention or misconduct in this department, abundantly demonstrate the propriety and advantage of the requisite melioration; and, also, the irrefutable soundness of these conclusions. Towards the termination of the eighteenth century, and beginning of the nineteenth, the amendments and improvements, which have been progressively accomplished, are confessedly very considerable, and, most undoubtedly, proportionally advantageous. These observations, however, are more immediately and particularly applicable to the rectifications so beneficially instituted in the Royal Navy of the British Empire.

XXI. Descending to an examination of the different merchantmen, there is sufficient cause, unluckily, for almost universal reprehension; the condition of many of these vessels is offensive and abominable: even the Indiamen, employed by the overbearing company of monopoly, are far from being unexceptionable. The advantages originating from what corrections and reformation may have been introduced into the dietetic ministration of sailors, in warlike and other ships, will adequately compensate the additional trouble and expense. To the philanthropist it must be the source of comfortable and satisfactory reflection, and to the patriot the cause of exhiliration and encouragement. The management of the diet of seamen, is, therefore, it is unreservedly confessed by all, of considerable, yea, more, of indispensable importance; and the consequences of its improvement are already beneficially conspicuous. The advantages of meliorations in the mode of victualling seamen, have been more especially experienced during the last war; and necessity formed a principal incitement to the introduction of diversified amendments. As is occasionally hinted in these disquisitions, the common tendency of the human mind is to advance in discovery, so this consideration has collaterally aided and led to additional advantage. Observation and experience, also—as in all other departments of knowledge, so in that of navigation, in all its multifarious circumstances—have contributed to beneficial regulations and consecutive management.

XXII. A sufficiency of the respective soundness or perfection of the different substances supplied, naturally and properly requires distinctive attention in their first procuration, and also proportionate management in their conservation. The more excellent the properties they originally possess, they will, consequently, have the greater capability for the desireable preservation, and prove proportionally serviceable in the prolongation, of healthiness. The ordinarily inconvenient consequences of their protracted employment will also be adequately diminished. This circumstance, separately considered, is doubtlessly legitimately a consideration of importance; but, nevertheless, in calculating the probability of the lastingness of healthiness, or immunity from distemper, a multitude of circumstances must necessarily be taken into contemplation. These have been partly called into remembrance in the preceding observations, and will be hereafter farther investigated.

XXIII. A sailor is a man who very rarely partakes of delicacies or luxuries; accustomed to the hardness of servitude, and the roughness of his ordinary allowances, his appetite must be sufficed with the articles commonly presented. He is, however, as far as artificial restraint, and the possibility of his attainment may accommodate, particularly obsequious to the indulgence and gratification of his inclinations and irregular propensities. By inconsideration, imprudence, and the most irremediable stubbornness and inflexibility, he, moreover, too frequently implicates himself in misfortunes, and a thousand other indescribable inconveniences. As long as his prog and grog are regularly forthcoming, he very commonly keeps his cheerfulness and seemingly unaffected deportment. The annumeration of his enterprises, his hair-breadth escapes, and his own bacchanalian tumultuations, and his amorous exploits, are the pleasurable entertainment of his vacant hours. Although these are a few of the descriptive characteristics of the sailor, purposely and confessedly obnubilating in the cloudiness of concealment, many of his imperfections and wickednesses, nevertheless, from his serviceableness, he rightly deserves his apportioned assortment of victualling.

XXIV. From the animal kingdom, beef and pork are chosen, because they endure the needful processes for their preservation from putrefaction, in a manner superior to most other animal substances. The firmest, healthiest, and fattest, are generally the most suitably qualified for the operation of salting or seasoning. The conserving influence of sea salt, or muriate of soda, has been employed for these purposes from time immemorial. It appears to have been the principal article used by the ancients in seasoning and preserving their victuals, or other substances, from putrefaction and destruction. It was considered so essentially necessary for the latter intentions, that it was the metonymical representative of the uprightness, the durability, and inviolable nature of a conventional agreement. From its smartness, or tartness and sharpness, it was, moreover, figurative of wittiness and satirical keenness, "Modò; Sit mihi mensa tripes, concha salis puri," here it was applied for the purposes of cookery, or to promote the poet's digestion. "Ergo, Hercule, vita humanior sine *sale* nequit degere, adeoque necessarium elementum est, ut transierit intellectus ad voluptates animi quoque. Nam ita *sales* appellantur omnisque vitæ lèpos et summa hilaritas, laborumque requies non alio magis vocabulo constat." *Plin.* "Accedunt non Attici, sed, salsiores quam illi Atticorum, Romani veteres atque urbani *sales.*" *Cic.* In these quotations, it assumes different modifications of its translated or metonymical signification.

XXV. Saltpetre, &c. sugar, different aromatic vegetables, have been employed for preserving alimentary and other substances. The alterations produced by saltpetre upon the lifeless remains of animals, has not been intelligibly explained, or rather, they are not understood. Their reciprocal agency, for such it must be, is entirely unknown, but, certainly, a chemical operation is produced. A particular alteration happens in both articles; and, most probably, a different arrangement of their constituent ingredients is the consequence. Several of the sensible qualities of the animal matters are changed. The texture, the colour, the flavour, the taste, the actual measure, severally undergo an alteration. These phænomena seem to indicate chemical operation, and some alteration in the component particles of these substances. The particular nature and extent of this change, however induced by the union of sea salt and animal matters, in the present state of chemical science, cannot be unfolded and ascertained. Sufficient attention has not been bestowed upon this important business, and which so intimately concerns the health and welfare of many thousands of mankind. This is a subject interesting not only to seafaring people, but to those who are topically confined to garrisons, or other particular situations in which the needful supplies of fresh provisions are not obtainable. The examination of this subject is peculiarly desireable, and he who first explores and elucidates it, with scientific penetration and explanation, will eminently deserve his epitheton emblazoned in golden letters in the Temple of Reputation.

"Mobilitate viget, viresque acquirit eundo.
Parva metu primò ; mox sese attollit in auras,
Ingrediturque solo, et caput inter nubila condit.
——Magnas it Fama per urbes :"——

XXVI. According to chemical analysis, animal substances are said to contain a certain quantity of muriate of soda in their composition. But it is by no means certain that it subsists in the fluids or solids of the body in an uncombined state; so, then, this matter remains under unrevealed disguise. What purpose does it answer to the animal? Is it derived from the quantity commonly employed as a condiment, or is it evolved from the other matters used as food? In what component part of the animal is it more generally contained? or with which does it commonly associate? or is it equally diffused over the constitution? Does it continue pretty uniform in its absolute quantity, or is it liable to variation? What are the particular alterations expected and effected by salting animal substances? Does the chemical operation commence immediately, or is it only gradually completed? which of their constituent particles principally take on or generate the peculiar and conserving alteration supposed to be produced? Is the composition of muriatic acid explained and thoroughly confirmed, as has been suggested? Is the salt, in some degree, decomposed in the intimate operation, which may be supposed to happen, when it is combined with muscular and other substances? What is the positive condition of the acid and mineral alkali, as they subsist in the formation of common salt?—The catalogue of interrogatories might be amplified, but it appears, in this place, somewhat ineligible and unnecessary. Similar difficulties arise in considering the operation of saltpetre, and the whole number of those articles employed for condiments or antiseptics. The operation of the nitrate of lixive upon animal substances must be somewhat different from that which muriate of soda produces. The sensible, or more ordinary properties of these matters, are somewhat dissimilar from those preserved by means of sea salt; and in the colour there is a different variation. The consequences of their operations are subjects of common observation, but the fundamental and efficient principles accomplish their purposes under the veil of difficultly penetrable concealment.

XXVII. The saltpetre appears to have the peculiar property of reddening the different animal substances with which it is joined for the purpose of seasoning. Wherein this particular alteration consists, has not been ascertained; but it is reasonable to conclude, that it possesses some influences different from those of muriate of soda; as indicated by the firmness, coloration, and other perceptible alterations of the flesh to which it has been applied. The nitrate of lixive is a powerful antiseptic, and commonly employed in the different condiments for conserving different perishable substances from putrescence and destruction. Sugar, also, has been ascertained to be serviceable for these intentions, and it is sometimes conjoined with the nitre, or common salt, in the processes of seasoning. Every cook and confectioner knows how beneficial it is in preserving many of their vegetable preparations. This substance, when used in combination for the preservation of animal materials, most probably produces its beneficial consequences, by its readiness in associating with aqueous moisture. By the absorption, and subsequent convenience to evaporation, of all liquidity or dampness, one of the principal requisites for the putrefactive decomposition is thus more or less disengaged, and the proneness of the meat to dissolution is thus powerfully counteracted. The advantages obtainable from the application of sugar, in various conditions of pureness or refinement, as a preservative condiment, are universally understood, and it has been used immemorially for the conservation of vegetable substances.

XXVIII. Animal matters may be kept unchanged for a great length of time, if they are retained in a sufficient degree of coldness. When, for example, they are covered with ice or snow, no putrefaction is commonly remarkable. Artificial, and especially accelerated or hasty exsiccation, also disposes fleshy matters for the resistance of the putrescent operation. The South Americans, and many other people, prepare it in this manner, and also fish; and thus they become susceptible of lengthened preservation. Involving beef, &c. with different substances, such as tallow, or the fatty matter of boiled meat, &c. have been found adequate for preventing any particular alteration for some time. Boiled meat has thus been kept in a passage from England to India,—a performance comprising occasionally a space of time equal to five or six months. This mode of treatment must operate principally by precluding the contact of the air, and also the immediate approach of any excremental depositions, or animalcular nidulations. All these circumstances are particularly and powerfully advantageous to the putrefaction of animal substances. The previous boiling of the flesh, also, probably produces some change in the chemical condition, or natural arrangement of the component particles of these substances, whereby the susceptibility to decomposition is considerably restrained. The removal of moisture from those bodies which may have undergone arefaction, must be a principal cause of their subsequent capability of augmented preservation. This appears a sketch of the explanation of the general action of this mode of preparation.

XXIX. As the preservation of some of the animal part of provisions is an object of remarkable importance, the following observations are taken from M. Appert's pamphlet on the Art of Preserving all kinds of Animal and Vegetable Substances for several years, &c. This work was altogether unknown in the course of this composition, and the subsequent notes have been borrowed from some transcripts from the original production. M. Appert makes the following remarks: how salt "communicates an unpleasant acerbity to substances, hardens the animal fibre, and renders it difficult of digestion. It contracts the animal parenchyma. On the other hand, as it is indispensable to remove, by means of water, the greater part of the salt employed, almost all the principles which are soluble in cold water are lost when the salt is taken away: there remains nothing but the fibrous matter, or parenchyma; and even that, as has been said, undergoes a change."—His management appears to consist principally in secluding the common air, and the application of a determinate degree of heat in his preparations. He describes some of these circumstances, as follows:

XXX. "This method is not a vain theory. It is the fruit of reflection, investigation, long attention, and numerous experiments; the results of which, for more than ten years, have been so surprising, that notwithstanding the proof acquired by repeated practice, that provisions may be preserved two, three, and six years, there are many who still refuse to credit the fact. Brought up to the business of preserving alimentary substances by the received methods; having spent my days in the pantries and breweries, storehouses, and cellars of Champagne, as well as in the shops, manufactories, and warehouses of confectioners, distillers and grocers; accustomed to superintend establishments of this kind for forty-five years, I have been able to avail myself, in my process, of a number of advantages, which the greater number of those persons have not possessed, who have devoted themselves to the art of preserving provisions. I owe to my extensive practice, and more especially to my long perseverance, the conviction: 1st, That fire has the peculiar property, not only of changing the combination of the constituent parts of vegetable and animal productions, but also of retarding, for many years at least, if not of destroying, the natural tendency of those same productions to decomposition. 2nd, That the application of fire, in a manner variously adapted to various substances, after having, with the utmost care, and as completely as possible, deprived them of all contact with the air, effects a perfect preservation of those same productions, with all their natural qualities. Before I state the details of my process, I ought to observe, that it consists principally: 1st, In inclosing in bottles, the substances to be preserved. 2nd, In corking the bottles with the utmost care, for it is chiefly on the corking that the success of the process depends. 3d, In submitting these inclosed substances to the action of boiling water in a water-bath, for a greater or less length of time, according to their nature, and in the manner pointed out, with respect to each several kind of substance. 4th, In withdrawing the bottles from the water-bath at the period described."

XXXI. By way of illustration, one process may here be introduced—Boiled meat. "I put a quantity of meat into the pot, to be boiled in the ordinary way. When it was three-fourths boiled, I took out one-half of it, the bones of which I had already taken off, as I purposed to preserve it. When the meat (the remainder,) was completely boiled, I strained the broth, and after it had become cool, I put it into bottles, which I corked well, tied and wrapped up in their several bags. The beef which I had taken out when three-fourths done, I put into jars, which I filled up with a part of the same broth. Having corked, luted, and tied up these, and wrapped them in bags, I placed them, and the bottles containing the broth, upright in a cauldron or boiler. I filled this boiler with cold water up to the rim of the bottles and jars. I put the lid upon the boiler, causing it to rest upon the vessels within, and took care to surround it with a wet linen cloth, in order to impede, as much as possible, any evaporation from the water-bath. I heated the boiler, and when the water-bath had been made to boil, I kept up the same degree of heat for an hour, and precisely at the end of the hour, let the fire pass into an extinguisher. Half an hour afterwards, I let off the water from the bath, by means of the cock at the bottom of the boiler. At the end of another half hour I took off the lid. An hour or two afterwards, I took out the bottles and jars. (The time of doing this is, however, immaterial, and the operator will consult his own convenience.) The next day I besmeared the corks with rosin, in order to forward the bottles and jars to different sea-ports. At the end of a year, and a year and half, the broth and boiled meat were found as good as if made the day they were eaten."

XXXII. This appears to be a subject of the highest moment in the Public Services: how beneficial a few meals of fresh meat, or meat possessing nearly the qualities of this substance when unsalted, would be, must be well known to army and navy surgeons. It is not unknown, also, that meat can be preserved for a length of time after being boiled, or even parboiled, and then enclosed in vessels excluding the access of the atmosphere; or it can be preserved, by being surrounded with suet in a state of liquidity, which acts as a defensive involucrum when congealed. As the access of atmospheric air is powerfully aiding to the process of putrefactive decomposition, so the absolute seclusion of the Pot-au-Feu de Ménage of M. Appert becomes necessary. Without this exclusion of the air, the action of putrescence, and consequently putrefaction, would be both rapid and irresistible. The expense of glass vessels would seem to prohibit (at least upon an extensive scale,) this mode of preserving the meat; but it, however, appears to be the most cleanly and delicate. But it is very probable, that vessels made of tin, or even strong earthen jars, well glazed on the exterior surface, might answer the purpose. Different cheap contrivances might easily be suggested for these purposes. It is even not improbable that wooden vessels, or casks, would be suitable and sufficient for its complete preservation. Small casks framed of the best American oak, as it is called, or the Indian teak, and highly polished, would appear to be sufficient, or their internal surfaces might be carbonized. The ends at which the meat were put in, might either be secured in the usual manner, or they could be screwed in, or they might be so framed that the ends might be covered with a lid, properly fitted, and the juncture defended, or made air-tight, with some tenacious substance. Different matters answer for the formation of these cements or lutes: such as wax, in the proportion of eight parts to one of turpentine, and its consistency and pliableness are modifiable by the proportional addition of any resinous substance. Different other compositions might be mentioned, but it seems here unnecessary. A proper attention to this subject may be of singular benefit in the Public Services, for the assistance and restoration of the debilitated and convalescent. Many thousands have perished in the defensive and commercial employments, through deficiency of the suitable alimentary supplies. In garrisons, likeways, the occasional assistance of meat, almost or altogether in the state of freshness, would frequently be particularly beneficial.

XXXIII. In agreeableness to the present mode of management, the ordinary method of seasoning, however, can alone be trusted, when the animal provisions are intended for the tropical and other scorching climates, and other tediously protracted voyages. It appears, indeed, that beef, prepared agreeably to the Moorish or South American method, can be preserved in tolerable perfection, even in the warmer climates; and afterwards, when qualified by boiling, steaming, &c. reassumes, in some measure, the more ordinary and sensible properties of beef which has never been seasoned. A peculiar odour, however, and which is commonly offensive to those unaccustomed, always accompanies the beef which has gone through this plan of preparation. The article is commonly prepared, by slicing the flesh or muscular substance into long shreds, and then subjecting it to the action of a pickle, composed of muriate of soda, &c. for about twenty-four hours; and it is then exposed for the purpose of hastily dispersing all moisture. Continuing the act of drying, it acquires a considerable firmness; and if now secured in close vessels, it is capable of keeping for a length of time, in tolerable condition. Beef, thus prepared, is susceptible of long preservation; but to those who are not used to such food its employment is disagreeable and unpalateable, and will probably not be generally adopted.

XXXIV. The assortment and selection of the different articles—such as beef, pork, butter, cheese, flour, biscuit, pease, barley, oatmeal, potatoes, &c. &c.—which are the principal alimentary substances supplied for the use of seamen, are circumstances demanding discrimination and carefulness in management. They should all be of the most approved quality, and more especially when intended for use in lengthened voyages, and which often presupposes the intervention of tropical or other severely heated latitudes. It appears also adviseable, that they be recently, but perfectly prepared, and each possessing the common and ordinary appearance of unimpaired goodness. It is repeated, the original perfection and goodness of all alimentary substances, collected for long voyages, are properties which they should constantly and invariably have in possession. The most effectual precaution should always be used in their preservation; as will be occasionally suggested in the following observations upon the particular substances enumerated. Different methods have been adopted for securing and retaining these matters; but they are so generally and tolerably well understood, that it surely would appear needless to particularize the circumstances of management. It may, however, be insinuated, that purveyors should be properly acquainted with the necessary, requisite, and descriptive properties, of those commodities which belong to their business of procuration.

XXXV. Flesh, before it is subjected to the operation of seasoning, should be carefully separated from all bloody or watery liquids; and, with this intention, it might be useful to expose it to moderate and regulated pressure. This removal of moisture, would be depriving it of one of the necessary and powerful ingredients so favourable to the putrefactive decomposition. After being disengaged from all separable moisture, the customary method of seasoning, salting, or pickling, which need not be here described, may then be conveniently performed. This necessary operation being perfectly completed, the meat should be carefully compacted in vessels which are absolutely air-tight. It does not appear particularly serviceable to have the proportion of briny liquid which is commonly employed. The pieces of meat may be so closely packed as to allow very inconsiderable interstices, and, if any should be observeable, they may be filled up with powdered sugar, with as little adhering moisture as possible.

XXXVI. Vegetables should likeways be carefully and knowingly exsiccated, before they are reposited in their different enclosures. This is a consideration never to be neglected. It is almost universally and continually requisite for the continuance of their preservation. Vegetables, it may be observed, almost without exception, may very usefully suffer the dissipation of a very considerable proportion, or rather the whole, of their juiciness or adventitious moistness, without any prejudice to their physical properties. This precaution, from a multiplicity of considerations, is in general commendable. This proportionate or determinate exsiccation, increases their disposition and capacity for preservation from corruption; it frequently and remarkably diminishes their cumbersome and inconvenient amplitude, and thus fits them for stowing more commodiously. In the progress of examination, the respective substances will be more distinctively considered, and some respectively applicable observations will be introduced. This susceptibility of a lengthened preservation, is of great importance, and will often be singularly subservient to the maintenance of healthiness, when most other circumstances perhaps are unfavourable. Some of these articles, when once their dampness is sufficiently evaporated, are susceptible of keeping without any further very particular management. Some of them, however, require enclosure in receptacles calculated to exclude moisture and other intrusive mischiefs. A valuable assortment of vegetable substances, may, in this manner, be preserved in tolerable perfection, even in protracted voyages, and in different climates. And when they are subjected to the culinary processes, generally necessary for preparing them for food, they should be previously immersed in warm water, and allowed to imbibe a quantity of moisture. They may also be exposed to the influence of steam, somewhat condensed, which is easily done by a suitable contrivance.

XXXVII. The bulk of many articles may be very considerably lessened, and by this method a more extensive assortment is allowable. Considerations, drawn from the scantiness of suitable vegetables, will be the most agreeable arguments in confirmation of this conclusion. The deficiency of a convenient supply of vegetables for the use of seamen, is frequently lamentable; and, in particular situations, the procuration of them, possessing a native freshness and succulence, is impossible. The accommodation of this unavoidable imperfection and inconvenience, is the only succedaneous plan which is attainable: and this will be accomplished, only, by the substitution of a proper variety of carefully exsiccated vegetables, &c. Arefaction is not necessary for the temporary preservation of every vegetable, but a sufficient degree of dryness is certainly requisite for the ensurance of those intended for keeping, or lengthened preservation. It would appear that M. Dumont has lately "announced the important practical discovery, that fruits may be preserved by means of carbonic acid gas." This aerial compound is well known to possess powerful antiseptic properties. It is mentioned that "cherries, grapes, pears, apples, and chesnuts, were placed in glass vessels, filled with carbonic acid gas, obtained from lime by sulphuric acid. Neither the colour nor the taste of the cherries were altered at the end of fifteen days; and at the end of six weeks, they were in the same state as if they had been preserved in brandy." If this proposal shall be found effectual for preserving different fruits or vegetables, for a considerable length of time, the discovery may be of particular advantage to the seafaring; for the occasional assistances of this description to the debilitated and convalescents, &c. would, at least, contribute to afford them a pleasing variety, which, in the dietetical administration of the indisposed, will frequently be singularly acceptable. An agreeable supply of some fruits and vegetable substances, such as conserves of parsnips, carrots, &c. would be very beneficial to those threatened with scorbutic complaints. The expense of glass vessels, and their liability to breakage, may be exclusive arguments against the method proposed; but, if it shall be experienced to be serviceable, perhaps some other vessels may be contrived to answer the desireable purpose. It may likeways be worth while to try this mode of management with some animal substances. As the carbonic acid air is easily and cheaply obtainable, and no great difficulty in filling the vessels with it, the method proposed can conveniently be reduced to experiment. Another advantage may be mentioned, that, as this species of air is specifically heavier than atmospheric air, it will remain in the vessels for some time, and thus allow them to be properly filled with the substances which they are intended to comprehend.

XXXVIII. The proportion of flesh supplied is sometimes too large, and especially in tropical climates, where a natural inclination for fresh vegetables is so particularly remarkable. The abatement or diminution of the allowance of meat in these regions, and a proportional substitution of vegetables, would be highly adviseable and beneficial. As formerly related, considerable and profitable amendments have been instituted in the Royal Navy; but, what is unfortunate, they have not such extensive establishment and application in the different merchantmen. Those advantageous improvements have been originally suggested, and gradually performed, by the intercession and labour of different humane, friendly, and attentive and patriotic individuals; and what must give them unspeakable satisfaction, is, that in proportion to the advancement and adaptation of these meliorations, the healthiness, and, consequently, the usefulness of British Sailors, have been, in a certain degree, commensurate.

XXXIX. Seamen, generally speaking, require an ample allowance of substantial food; their meals and grog are by them, indeed, considered as absolutely indispensable ingredients in the composition of their maintenance and happiness. Any diminutions and unexpected innovations, in their ordinary and accustomed quantities, qualities, &c. generally produce discontent, and the supposition of an unfriendly imposition. Healthy seamen in moderate temperature, or in the colder weather of temperate latitudes, &c. will be capable of overcoming those substances, which the slothful and luxurious would consider to be difficultly digestible, or productive of some unforeseen mischief. Sailors are often laboriously employed, which is frequently a powerful excitement to digestion; they have, generally, been accustomed to ingurgitate cumbersome quantities of victuals; if, therefore, they were restricted of these habituated allowances, they would naturally consider it as an unfriendly and intolerable imminution of their privileges. They necessarily endure multiplied hardships, but, excepting in particular instances, their outward distresses very seldom impair the functions of their voracious ventricles. Their digestion generally proceeds rapidly, their evacuations are commonly plentiful, and, therefore, their requisition for nutritive assistance is extensive and frequently returning.

XL. As formerly mentioned, the conjunction of animal with vegetable substances, seems the most congenially agreeable and suitable for the nutriment of mankind. The proportions, as already described, fluctuate from the diet of the carnivorous, downwards, to many of the Asiatics, who live almost exclusively upon vegetables. Anatomists and naturalists, in support of the conclusion—that a combination of these materials, properly apportioned, constitutes the most nourishing diet of man, produce arguments from the formation, structure, and other apparent properties of their intestines; and also from the figure, arrangement, &c. of their teeth. An original permission, and, consequent, very extensive use, has pretty diffusedly established this combined form of sustenance. The consentaneous approbation and usage of man in all civilized countries, has thoroughly ascertained the propriety, the usefulness, and continuance of this circumstance. A judicious adjustment of the proportions of these alimentary allowances, properly and naturally requires a more careful attention to its distribution, than what, in general, has hitherto been administered.—*These* generally applicable observations and suggestions being in promptitude, the individual substances most ordinarily belonging to this department, and commonly furnished to sailors, shall now be brought forward for examination, in their respective circumstances.

XLI. And commencing with the most important and extensively employed of the animal substances, the staple article, Beef, is deserving of particular consideration. Muscular substance, or *flesh*, as it is commonly understood, is that part of animals which, in considerable proportion, constitutes the nourishment of the flesh-eating portion of mankind. The diversity of muscular substances must be prodigious, and surpasses all investigation. The flesh of the bullock (the bos testibus privatus,) is different from that of the calf, and there is a particular difference betwixt either of these and that of the hog, (the sus scrofa,) and a remarkable dissimilarity between any of these and the flesh of the common fowl, (phasianus gallus,) and fish exhibit a peculiarity altogether disagreeing with any of the foregoing.—Flesh is composed of fibres compactly and collaterally aggregated, and, with regard to each other, commonly partaking of a parallelism and longitudinal distribution; but, when quiescent or unstretched, always representing some degree of incurvation, or, more accurately speaking, obtusely angulated undulations. To facilitate and conciliate the convenience and readiness of the different necessary movements, the different interstices of the muscular fasciculi are completed with what is commonly called the cellular substance; and it likeways surrounds or envelopes the particular muscles. In the intervals betwixt the muscles, it constitutes an elastical involucrum for the larger blood-vessels. It is even spread amongst the recondite integrant muscular fibrillæ, and forms a very diffusedly connecting intermedium through the whole corporeal contexture. Unsalted muscular substance, besides these and several other bodies, always contains a quantity of blood, either remaining in its original vessels, or in the state of effusion. The neglect of the sufficient separation or expression of this bloody humour, and other liquids, is frequently conducive to putrefaction. And this misfortune is more particularly detrimental, if this decomposition has commenced before the performance of the operation of conservation.

XLII. The principal and fundamental constituent of muscular substance, has, amongst modern chemists, obtained the name of *fibrin* for its designation. This substance is likeways contained in different vegetables, and in blood it is always discoverable. Whether that in the diversified substances employed for aliment be immediately appropriated to the services of the animal, or if it is modified by the peculiar faculties of digestion and assimilation, is indetermined. An argument, almost conclusively impugning the first opinion, is the decomposition of every substance received into the stomach before it is adequately prepared for its particular destination, and organical apposition, and constituent adaptation. This conversion of different substances into another condition, or, perhaps, even apparently, another nature, is one of the most wonderful properties which animate structure possesses. Those parts of other animals which seem to have all the sensible properties of those to whose sustenance and composition they are determined and appropriated, would appear to undergo some alterations before their ultimate destinations. Notwithstanding the tendency of these observations, the properties of the animal, fed upon particular substances, would seem to be liable to some modification, although not appretiable, conformably to the preparations the different alimentary substances may have undergone, previously to their employment. As elsewhere observed, a remarkable difference is frequently conspicuous betwixt those who are supported by mild well-prepared diet, and those who use either large quantities of animal food, or who use it almost in a raw condition. Some of the peculiarities of cannibals, or anthropophagi, may in this manner be explicable. A very notable difference, likeways, is perceptible betwixt the ferociousness of wild animals, which subsist principally on raw meat, and those, even of the same genus, which are more commonly fed on food which has undergone the customary culinary preparations.

XLIII. Fibrina, when separated from most of the matters with which it is naturally associated, is of a white colour, fibrous texture, tasteless, and without any particular flavour; insoluble in aqueous liquids, and in alcohol; when recently prepared, has some degree of elasticity and similarity to the glutinous substance obtainable from vegetables. That more directly procureable from muscle is somewhat transparent, has little ductility, and, when dry, is brittle. This substance, when separated from the other materials, undergoes no apparent alteration, even in prolonged exposure to the atmosphere. And it is not materially changed from being some time immersed in water. The fibrin appears one of the least inalterable of the constituents of the blood, or of muscular substance; but the fibrous matter obtained from the latter is not so liable to putrefaction. The cellular texture, also, requires a curtailed examination. The cellular fabric and its contents, more correctly styled fat, answer many purposes to the animal, and some of these have been lately mentioned. This substance regulates, very remarkably, the universal magnitude, plumpness, smoothness, and roundness of the body; and constitutes, almost universally, a defensive or protective integument. The proportion, the coloration, the consistence of this substance, are variegated in different creatures, or at different times in the same individual. In determining the properties of flesh, for the purposes of dietetical application, these circumstances should be nicely investigated, and completely understood. The explication of the ordinary properties of one article belonging to the animal kingdom, will be perfectly sufficient to communicate adequate information concerning the whole in this subdivision

Something must be left for exercising the ingenuity of those who undertake the management of this department.

XLIV. Beef, Pork, &c. &c.—The texture of good beef, when seasoned, should be regular; possess sufficient and equably diffused firmness; should not have any observeable intermixed flaccidity, or unnatural softness or flabbiness; no unpleasant or uncommon flavour. The odour of the beef, when boiled, should be agreeable; but this property cannot be imparted by description, but immediately intelligible to those experienced in observation. The muscular part of raw beef should have a shining rubescent colouring; or, if ligamentous or tendinous substance be intermixed, then a glistening whiteness, with a variable proportion of redness, will be remarkable. These appearances are accidentally modifiable by the nature and other concomitants of the plan adopted for its preservation. The colour, especially, is alterable and variable by the different quantities of saltpetre, &c. which may have been employed. If the muscular and adipose matters appear inclined to separation, or are without difficulty disjoined, this occurrence manifestly announces that a proneness to putrefaction has commenced, or may be in considerable progression; and it is, in proportion, therefore, to this deterioration, objectionable. This putrescence is commonly first observeable in the muscular interstices, and is gradually propagated along the connecting cellular membranes, &c. and still more particularly in the contiguity of the blood-vessels. The cellular structure also undergoes manifold variegations; the muscular bundles and fibrillæ become loosened or disjoined, and the part in which putrefaction may have commenced appears filamentous, acquires an uncommon softness or laxness, and sometimes an oiliness and the phænomena of protracted maceration. The fatty parts of sound beef should likeways be tolerably compact, not of a turmeric or marigold yellow, nor show the least trace of blueness or greenness, nor the combinations of these in any conceiveable proportions. These may appear either separately or in variegated combination, and be justly considered the forerunners or concomitants of putrescence. Sometimes the cellular contexture becomes collapsed and stringy, and likeways discoloured, in the manner just explained. The goodness of a whole piece, &c. will often be generally impaired: this putrefactive decomposition is readily perceptible, and should constantly be regarded in procuring or supplying this valuable and necessary alimentary substance.

XLV. Pork, Tripe, Fish, are all severally and occasionally employed for aliment to sailors, but it seems unnecessary to describe the particular properties of these, as the subject, as far as ordinary principles are concerned, is tractable upon these generally; and the qualities of them are all so conveniently determinable, as not here to need any particular description. Tripe, most probably, supplies less nutriment than several other animal substances, and is not speedily digestible. This is an article, however, which is commonly furnished, and may be occasionally given, as some variation in the method or form of victualling is very desireable. Pork is, strictly speaking, not easily overcome by the operation of digestion; but this, as lately hinted, is, amongst sailors, very rarely a cause of inconvenience. From its abounding in adipose matter, it may be serviceable to those who have either a constitutional, or accidentally superinduced tendency to slowness or insufficient evacuation of the intestines. Additional admonitions upon these things will be hereafter introduced, when the alimentary substances are collectively considered.

XLVI. A great variety of animals is employed for food to man, but a very confined number forms the collection furnished for use on shipboard. And it does not appear a consideration of remarkable importance from which of the species of the bos tribe it may be obtained. The bullock, perhaps, supplies the best beef, and that of the heifer, too, may be admitted. The flesh of the cow and bull are not so proper for the necessary processes of seasoning, and, moreover, when preserved by this operation, they may be considered as not such pleasant and agreeable aliment as some of the foregoing. Salted mutton is not commonly employed; but that obtained from the larger, fuller, and plumper sheep, might be permitted, for the purpose of affording a diversity. Amongst the Ægyptians, the flesh of the wether, the aries castratus, was in particular estimation, and said to be one of the most commonly employed of animal substances. "Usus carnium apud Ægyptios est temperatissimus, atque non minus simplicissimus, omnes ferè arietum castratorum carnibus vescuntur."—*Alpinus de Medicina Ægyptiorum.*

XLVII. Another article of animal production is cheese, and is frequently provided and employed, in larger or smaller quantities, according to accompanying circumstances. This substance has been familiar to mankind, even previously to the commencement of historical recordation. It was known to the Hebrews, the Greeks, and the Romans. Hippocrates generally disapproves this substance, but considers it as not equally injurious to every individual. In one place he says, "Caseus flatum et adstrictionem parit, cibos incendit, crudum et incoctum edulium existit, ejusque usus inter potandum repletis teterrimus."—Celsus classified it with those matters which he considered "aliena stomacho sint;" and likeways with those "quæ intùs facilè corrumpuntur, caseus recens et vetus." His countryman Virgil, however, appears to have thought it a delicious article, and represents Tityrus, that is, probably, the poetical Mantuan himself, as requesting his friend Meliboeus (boum curator,) to partake of his collation, and to which he subjoins "sunt," &c. "et pressi copia lactis;" but whether the "copia lactis pressi" was in the form of cheese, (which is probable,) properly so called, or in that of curds, and perhaps with cream, cannot now be ascertained.

XLVIII. This article, when intended for seafaring people, should have been carefully prepared, possessed of unimpaired properties, and more especially if designed for long voyages or distant stations. A proper degree of plumpness, firmness, the appearance of regularity in its aggregation, with an agreeable and sufficient smoothness and entireness of surface, are always commendable. The peculiar flavour, too, of this article, is always pointedly regarded by those who have knowledge in this business. The colour commonly exhibits all the possible gradations of yellow, from the faintest variety of this, to the yellow mingled with the orange coloration. This is an accidental quality, however, and not absolutely necessary, or precisely expressive of the goodness or badness of this article. The general properties of cheese are materially influenced by the nature of the pasture upon which the animal may have fed; the qualities and habitudes of the animal itself; the nature of the different seasons; the quantity of the salt, or other articles, used in conserving this substance; and, also, the circumstances of the place in which it is laid for drying. The colour, therefore, of this article, it will be observed, can form no certain indication, in determining its absolute properties. When possessed of the requisite goodness, it is in general relished by sailors; and the moderate quantities commonly allowed, do not appear to be explicably injurious. If it is putrescent, or become the habitation of vermin, or their excremental depositions, it is improper, and should then be never employed. This article, if it has suffered, or been contaminated by the intrusion of reptiles, or by the lodgement of their eggs in any of its hollows or accidental apertures, &c. is hereby hastened to corruption.—These reflections constitute information and admonitions to those engaged in the business of the dairy, so to seclude their milk, with all its artificial products, that the contact of flies, and other hurtful animals, may be rendered impossible. The fulfilment of this design is so conveniently and effectually performable, that the neglect of the commended precautions, must be considered completely inexcuseable. The advantages of the smoothness and soundness of its rind, is, on this account alone, an object deserving particular attention. The smallest diruption or breakage of its surface, if accessible, is instantly occupied, as a domicilium for many of those offensive, insidious, and penetrating destroyers. The adviseable treatment, therefore, previously to the package of cheese, will be the careful and complete cleansing of all its superfice, with a gentle solution of fine soap; and then immersing it, for a little time, in a saturated aqueous solution of saltpetre; and then surrounding it with an involucrum, composed of wax, fine resin, and tallow, or this last combined with a small proportion of the nitre, minutely powdered. All these proposals, however, presuppose a faithful observance of the precautions necessary in its preparation; for if it already contains the rudiments of mischief, the other attentions will be perfectly unavailing. A further advice seems required, which is, that when the cheese is put up, for keeping or carriage, it appears improper to jumble the cheeses together, in immediate contiguity, in one apartment or enclosure, &c. Different vegetable substances will answer for filling up the interstices; only, it may be suggested, that these should be as clean, and have as little liability to putrescence, as possible. The saw-dust of fir would seem to be a convenient and preservative application.

XLIX. Butter is another animal matter commonly employed in the dietetic supplies of mankind, and this appears to have prevailed in every age, from the earliest historical information. The Greeks designated it with a particular appellation, which, literally translated, is caseus bovinus. It appears to be only once? mentioned by Hippocrates, and then it is proposed for external application. Butter possessing the necessary and agreeable properties, is of a pleasing yellow; but this existing in different intensities, according to the concurrence of many circumstances. The natural colour of good butter is commonly a lightish yellow, and previously to the conjunction of any other substance; this, however, is ordinarily somewhat augmented by the salt which is used for seasoning. This article, likeways, frequently gets diversified shades of artificial colouring; but these heterogeneous combinations should be considered as deteriorations, not as improvements. This substance, especially in warm weather, &c. is occasionally liable to a change, by which an acid, probably the cebacic, is evolved; butter is then said to have become rancid—although the presence of any acid in rancid butter, is refused by Parmentier and Deyeux—and is then improper for internal exhibition. When in this condition, it is offensive to the stomach, difficultly digestible, and if swallowed in undue quantities, may sometimes be productive of uneasiness, sickness, cardialgia, looseness, &c. Butter is mentioned, in some of the earliest accounts, not only as a dietetical article, but also as one of commerce. It is specified as a substance of commerce, in the Periplûs of the Erythrêan Sea. It is therein styled Βȣ́τυρον, that is, the Indian Ghee, which was brought over from India to Azania in Africa. "Ghee or butter, in a half liquid state, in India is a part of every sacrifice, and almost every meal; it is an article of export to Persia, Arabia, the coast of Africa, and the Mekran."

L. The general properties of butter—which, it is needless to mention, is procured from cream, which latter is gradually separated from the milk, and from its relatively specifical lightness becomes supernatant, and undergoes an augmentation of consistence from its exposure to the atmosphere—are extremely like those of the bland oils obtained by expression. The cream, when allowed to continue undisturbed, becomes acidulous; and this alteration very commonly happens before it is submitted to the operation of churning. It has been remarked, that this change accelerates the separation of the butter in the operation of churning. When this particular mutation, in the state of the cream, has not previously taken place, this operation is both more difficult and protracted. Notwithstanding the antecedent acidulous evolution, the butter afterwards obtained, never, when properly freed from the butter-milk, partakes of this property. Continuing the agitation necessary for the separation of the butter, there is said to be an increase of temperature, and, according to Berzelius, absorption of some oxygenous principle. Before the butter is subjected to the operation of pickling, it should be carefully washed, and perfectly disengaged from any remains of the butter-milk, or other adhering matters which might, in the smallest degree, diminish the probability of its preservation. The method commended by Dr. Anderson, is perhaps the best contrived for the ensurance of the conservation of this substance. The proposal is, previously to liquefy the butter intended for lengthened voyages, or distant settlements, by enclosing it in a convenient receptacle, and plunging this into another, containing water of a suitable temperature. This is easily ascertainable by thermometrical measurment; for butter melts at 96°, and consequently is semifluid from 80° to 90°, in the tropical or other warm climates; and thus the mucilage, as he calls it, can be removed. When the butter recovers its accustomable consistence, he proposes muriate of soda, nitrate of potass, and sugar, to be employed as seasoning condiments.—The use of oily and greasy matters appear to be common among the various races of men, from the whale-blubber of the Greenlander, &c. to the ghee of the different Indian nations, and the oil-olive and butter of the Southern Europeans.

LI. The animal part of provisions being hurriedly discussed, the principal vegetable substances now supervene for a compendious examination. And fortunately for seafaring people, the assortment of these may be agreeably and beneficially variegated and extensive. This is a consideration of remarkable importance in attempting the preservation of the healthiness of sailors, and has been only lately adequately comprehended and sufficiently appretiated. All those vegetables which are more immediately applicable, are almost exclusively obtainable, either from the graniferous or bulbous-rooted vegetables. Wheat, barley, oats, rice, pease and beans, &c. are more particularly the constituents of the first; potatoes, yams, &c. are referable to the second subdivision. It is intended to describe and consider only those vegetable substances which are ordinarily furnished to the seafaring, to propose some others which may be occasionally serviceable, to enumerate some circumstances influencing their preservation, and to state some advantages which can be derived from particular modes of combination and preparation. Those substances, therefore, of indispensable importance, will chiefly constitute the objects of consideration.

LII. Wheat, in most of the countries of Europe, is the article of all others procureable from the vegetable kingdom in the most extensive employment; and is, as a nutrimental substance, the most excellent, the most estimable, and also the most acceptable. This valuable grain has been used ever since man could distinguish it from another, and constantly applied it both for alimentary and medicinal purposes. There are several species of this article, but of these the Triticum distichon hybernum, or common wheat, is the most generally cultivated in Britain. Two varieties of it are chiefly observed—the Triticum hybernum rubrum, the common reddish wheat, and the T. hybernum, with the white spike and grain. The qualities of wheat, as of all other grains, are in some degree determined by those of the ground in which it is produced. Wheat has been discovered in almost every quarter of the world, but appears to be most plentifully produced in the temperate latitudes. In the tropical climates it is not ordinarily cultivated, as in these rice constitutes a principal article of food with the inhabitants. It is cultivated commonly for the use of Europeans in their different settlements in foreign countries. But, in situations where rice can be obtained, they conform more or less to the practice of the natives in the employment of this substance. Even many, after they return to their native country, would generally prefer the rice to other grain, if they could have it in the same agreeable state of preparation to which they were accustomed.

LIII. The magnitude and plumpness of this grain, the thinness of its involucra or coverings, its comparative heaviness, its agreeable sweetness, and, upon mastication, its depositing upon the tongue a considerable proportion of a glutinous substance, are all declarations of its goodness. There should be no mouldiness or mustiness, no unpleasant nor unnatural odour, no uncommon spunginess or irregularity of consistence, ever perceptible. A grain of wheat, however, even when possessing the greatest physical perfection, has not throughout an uniformity of consistency. The external concentric layer has more softness, more elasticity, and is not so conveniently reducible into the requisite fineness previously to its employment for alimentary purposes—its springiness resists its pulverization. When wheat is properly dried, and all dampness afterwards sufficiently excluded, it is susceptible of long preservation. The dissipation of all its unnecessary or superfluous dampness, is an absolutely requisite precaution when it is intended for keeping; and the removal of all impurities is also commendable. By judiciously administered exsiccation, and ventilation, &c. the soundness of the grain is maintained, or rather its properties are frequently considerably improved. The proportion of flour obtainable from the grain, and, moreover, its fineness and whiteness, are augmented by a particularly determinate prolongation of its preservation. These short annotations are brought into view, purposely to recommend the advantages of obtaining flour which has been made from grain kept for some time, and especially from that which is destitute of all perceptible dampness. If supplies are intended for ships proceeding in voyages naturally expected to be of considerable continuance, it is highly adviseable that this grain be furnished before it be ground, when it can be easily prepared for the homeward passage, and thus be always in possession of wholesome properties.

LIV. It is customary, in different merchantmen, to carry out the allowance intended for the whole voyage, in the state of flour; but too frequently it has undergone, long before the completion of the undertaking, important alterations in its composition. The flour becomes putrescent, discoloured, nodulated, or agglutinated, and offensive for alimentary employment; it is also contaminated with animalcular depositions; it becomes the storehouse of innumerable vermicules, which infallibly prove its destruction. These misfortunes are often owing to the original badness or imperfection of the flour; and, very particularly and remarkably, to its dampness or moistness, with the supervention of high temperature; and, conclusively, to animalcular defilement, which predisposes most powerfully to render this article unserviceable, or even unsusceptible of preservation. The preclusion of these unfortunate occurrences is immediately explainable from these animadversions. The flour, therefore, should be procured from wheat of good quality, properly ripened, of some age, sufficiently exsiccated and exposed, for a very short time, in the sacks after grinding; but this exposure should be when the atmosphere is in the highest degree of dryness observeable. Before it is finally enclosed in the casks, or other vessels calculated for its reception, it should be narrowly examined—to determine that it is perfectly free from all moistness, or clottiness, and also disentangled from all improper and mischievous impurities. When thus properly prepared, it is capable of keeping for any length of time which may generally be requisite.

LV. Wheat flour.—This useful article in the nourishment of man, has, by chemical examination, been ascertained to be constituted of different ingredients. Of these the glutinous principle, the amylaceous, and the saccharine, are the most materially component. The starch is, in the largest proportion, next to this, the gluten—and of these the sugar is the smallest; and it likeways contains a fractional proportion of the albuminous principle. These different principles seem necessary to the formation of good bread; and from the suitable proportions of them, as naturally subsisting in wheat flour, its superiority to all other known grains in the formation of bread, by the intervention of fermentation, is deriveable. A few observations upon these important component substances, may be serviceable in explaining some circumstances accompanying the preparation, preservation, combination and employment, of these essentially necessary principles. The amylaceous principle constitutes the most extensive, and remarkable, and incorruptible, of any of these constituent substances. This body is separable from the others by kneading flour, previously reduced to a paste by water, under a gentle current of this liquid. By allowing this liquor to settle, the starch is gradually precipitated; but not in a state of absolute pureness, for it is commonly combined with some of the gluten carried along with it in the operation of kneading. The preparers of this article for the purposes of commerce, obtain it, at first, sufficiently disengaged from other adventitious substances, by an extensive mode of procedure. Starch, when unaffected by dampness, is a substance capable of long preservation. The proportion of this wholesome and nutritive matter, obtainable from flour, is very considerable. This, however, as may naturally be expected, is modifiable by the quality of the wheat from which it is prepared. If the grain is of good quality, and the flour properly cleansed and separated, the actual quantity of starch will be from $\frac{60}{100}$ to $\frac{70}{100}$ of the quantity of flour originally employed. Starch has been long known and used for different purposes.

LVI. Another ingredient, found in the composition of wheat, is sugar, or rather this in diminutive proportion, and combined with gummy matter. This remains in solution, in the water which has carried off the fecula, or starch, in company with some mucilage. The small quantity of saccharine matter which wheat flour contains, seems more or less necessary to the formation of good bread. But a principle which appears absolutely requisite, in the making of fermented bread, is the gluten, or vegetable glue, and which constitutes a larger proportion of this alimentary vegetable; said to be about $\frac{24}{100}$, than either the sugary matter or albumen. When first obtained from wheat, it is tenacious or cohesive; is inodorous, tasteless, and possesses elasticity, ductility, in an extensive proportion. When it has been exsiccated, it loses these properties, and is rendered brittle. These enumerated qualities are owing to the presence of moisture; and while it is thus combined, the gluten is quickly liable to decomposition, and undergoes a particular and spontaneous fermentation. This substance, it may be remarked, has a strong affinity or attraction for humidity. The glutinous principle, while proceeding through these alterations, displays many of the phænomena so peculiarly characteristic of the undisturbed putrefactive decomposition of animal substances.

LVII. These constituents of wheat flour—starch, gluten, and sugar—together with a very small proportion of mucilaginous and albuminous substances, are the ordinary ingredients of this vegetable, so commonly used for bread, and in various other forms for alimentary purposes. None of these, singly, is suitable for assuming the necessary alteration, rendering it convenient for forming into fermented bread. The absence of the glutinous principle, in many vegetables, prevents the possibility of the requisite fermentation productive of the new arrangement of ingredients for the formation of this useful farinaceous substance. These short sketches concerning this grain, have been proposed, with the intention of giving some notions of the articles entering into the composition of bread, or rather the ingredients which are necessary for its formation.

LVIII. The unleavened bread would, in all probability, be the first prepared by mankind. The mingling of the powdered grain with water, would readily be conceived a suitable method of reducing the flour to the state of a paste; and, after the subsequent alteration hereby induced, the evaporation of the superfluous humidity would be conveniently understood. In the temperate latitudes, where fermentation is so rapidly produced, this change would be accidentally observeable in flour which might be allowed to continue in a moistened condition. The mass would be noted to augment, become acidulous, and seemingly to acquire new properties. This operation of fermentation, contingently happening, would be unexpectedly remarkable, and thus might constitute the foundation of the method of preparing bread by fermentation. The bread thus obtainable, if not rendered bitterish or acidulous, or, as frequently happens by mismanagement, these occurring in still more unpleasant combination; from its goodness and pleasantness, would commonly acquire the preference. A fair conclusion it is, and strengthened by probability, that fermented bread was originally discovered by accident, and not the result of preconcerted investigation. The Hebrews, the most original people, were acquainted both with leavened, and bread unleavened; but the knowledge of fermented bread, they, most probably, acquired whilst sojourning amongst the Egyptians. A particular and ceremonial distinction was instituted betwixt them, and the use of unleavened bread was specifically enjoined to the Israelites, at their departure from Egyptian thraldom. They might then be truly considered in the predicament of sojourners, and the prescription of this kind of bread was indicative of uncertainty and festination.

LIX. Amongst the different nations immersed in the darkness of ignorance, and grossness of idolatry, the contrivance and preparation of bread was generally attributed to their respective divinities. Amongst the Greeks, for instance, Pan was considered the inventor of this article. The same applies to most human inventions, the birth-right of which is forgotten; they are commonly ascribed to some mysterious and supernatural interposition, or unexplained commencement. Unleavened bread, from its capability of prolonged preservation, is commonly the kind supplied for shipping. This kind was the first bread obtained by a modification of spontaneous fermentation of the component parts of wheaten, and the flour procureable from some other vegetables. When flour is permitted to undergo fermentation in sufficient temperature, and for a proper length of time, it is then denominated ferment or leaven, and is capable of imparting its specifical and assimilating influence to any proportion of this substance. The expression, therefore, has, from time immemorial, been metaphorically applicable to any article powerfully and quickly communicating its peculiar properties to others. And it has thus been metonymically expressive of the assimilating communication of intellectual debasement.

LX. Bread made before the spontaneous fermentation commences, is the biscuit of the moderns, an appellation of Gallican original, and intended to indicate that the article has been twice exposed to the operation of cooking or baking. This species of bread has been preferred and employed, because it continues for a length of time without further decomposition. The fermented bread, if properly managed and deprived of all moisture, and which is then called rusk, may also be kept in complete preservation, but is scarcely ever supplied for the use of common sailors. The operation of preparing biscuit is very simple;—the addition of water and salt to the flour, and the thorough blending or kneading of these, form the principal preparative circumstances. The quantity of water necessary is somewhat different, according to the qualities of the flour: the older and better the flour, the quantity of liquid required is the larger. The common proportions are about two parts of water to three of the flour. The paste is hastily made, and committed to the oven before the occurrence of fermentation. And it is likeways desireable, that the exhalation of the moisture in the oven be briskly and quickly conducted. This quickness of evaporation, in combination with the high temperature, appear to preclude fermentation, which would, unless in considerable coolness, infallibly happen, if the dough reduced into cakes were not instantly exposed to the suitable temperature.

LXI. The precise nature of the change effected in the compound used in the formation of bread is unknown, but that some transmutation in the composition occurs, must, from every consideration, be deemed indisputable. Every sensible property afterwards, is evidently different from those apparent in the originally composing ingredients. In preparing unleavened bread, it is necessary that it should be occasionally turned in the oven during baking. The biscuit generally provided for the use of shipping, is prepared from the coarser kinds of flour; and its roughness, brownness, and comparative compactness, are chiefly owing to this circumstance. Flour, obtained from a variety of other grains, can be formed into bread of this description—such are barley, rye, &c.; but wheat flour is the only article capable, without addition, of being formed into good bread, especially when it has to undergo, previously, some degree of fermentation.

LXII. Biscuit prepared from proper materials, should, at least, possess the following properties. A particular brightness when broken, or rather the superficial appearance of glossiness; but, in the coarser brownish biscuit, these are not so remarkable. The surface, after fracture, should also represent these phænomena, and also considerable smoothness, with irregularly disseminated glistening interpunctions. And when made to tremulate by percussion, the communication of a particular sonorousness, which, however, can only be acknowledged by experimental investigation. If inspected by the assistance of a glass, having the power only of very inconsiderable amplification, a contexture, possessing a great similitude to that of the common sponge, will be observeable; and this, after immersion or soaking in water, is more conspicuously distinguishable. This appearance is somewhat proportionate to the degree of fermentation succeeding the commixion of the component ingredients. The more observeable contexture of biscuit seems to have the arrangement more particularly remarkable, in the bread procureable by spontaneous or artificially excited fermentation, when it has been sufficiently accomplished, before the dough was thrown into the oven for the purpose of evaporating all its dampness. Good biscuit ordinarily has a considerable brittleness, if not, it may have absorbed moisture, which, if not dispersed, will sooner or later prove its destruction. This circumstance may also be owing to the original badness of the flour, or mismanagement in the preparation of the biscuit. A sufficient degree of dryness is determinable by its appearance, by its comparative lightness, &c. The specific gravity of this article is less than that of water, and, therefore, it for some time continues buoyant on the surface of this liquid. Biscuit speedily imbibes moisture, and then, if it is fine, appears precisely similar to moistened fermented wheaten bread; it swells greatly, becomes spongy, and gets an additional whiteness; whereas, the water in which it has been immersed acquires a proportional brownness. When it has absorbed as much water as it can contain, it is then very nearly equal to the specific gravity of the water, when tried hydrostatically. Upon handling, it now has a mucilaginous softness, with a little resilience, it feels glutinous, and should not be clammy or inclined to adhere to the fingers.

LXIII. This substance being of extensive importance as an article of provision, furnished both to the army and navy, its goodness and preservation are circumstances requisitely challenging the first consideration. The carefulness and skilfulness which have been exercised in its management, will, for its conservation, be found remarkably contributive. This article should always, in the variable latitudes, and in the tropical—in which latter, the readiness of the generation or evolution of the different vermin, which are so particularly inimical to biscuit, is so prevailing—be kept in vessels or barrels, which absolutely exclude dampness, or every other mischievous substance. The practicability of preserving this substance, will be very materially regulated by the dryness or moistness of it, when packed in its particular enclosures. The common method of exposing it carelessly in a place called the bread-room, is certainly very unfavourable to the possibility of its lengthened keeping. Whether it be thus deposited in bags or sacks, it must be indifferently exposed to all the variableness of the atmosphere, and to the intrusion of every reptile which is inclined, it is thus conveniently accessible. The huddling of it together in the bread-room, as is very generally done, is particularly objectionable. Considering the impropriety of this procedure, and also the risk of other prejudicial consequences, it is highly commendable, that this needful article be always, (and, especially, if intended for foreign voyages, or for long keeping in any climate,) put into receptacles lined with tinned iron, or in very clean casks, and capable of accurate closure. And if it possess the previously enumerated requisite properties, its servation will thus obtain the greatest possible assurance.

LXIV. Notwithstanding the usefulness and expediency of these precautions, which have been here earnestly recommended, by inattention and misguidance this article is too frequently doomed to debasement which was avoidable, and to destruction which might have been counteracted. If contamination or putrescence hath commenced, the biscuit should be freely exposed in dry air; and if the removal of dust, &c. be the intention, winnowing or agitating it in a gentle breeze, will prove serviceable. But, if there be any appearance of mustiness, dampness, mouldiness, flexibleness, &c. it should be laid in an oven, and exposed to moderately augmented temperature; 200° to 250° of Fahrenheit will be sufficient. This operation will evaporate adventitious humidity; accidental impurities, &c. will become pulverulent, and thereupon more conveniently separable. The biscuit which is unbroken, &c. may be smartly brushed, and the smaller fragments can be winnowed or otherways properly ventilated. If this cleansing process is suitably conducted, the biscuit will be much improved in its sensible properties, loathsome defilement removed, and the additional preservation of it very much promoted. Even when biscuit has been originally of the best quality, in a state of sufficient dryness and cleanness, yet this exposure and purification, removal of accidental moisture, &c. will be occasionally beneficial.

LXV. Fermented bread is seldom allowed to seamen, but in this there are a grievous mistake and considerable disadvantage; it would afford a pleasant and expeditely digestible aliment to the debilitated, the exhausted; and to many labouring under different illnesses, it is particularly necessary. Those revalescent from distempers, are likeways powerfully benefitted by a plentiful allowance of good fermented bread; and its place cannot be supplied by any other substitute. As before signified, this bread has been occasionally employed in all ages; and the method of preparing it amongst the ancients, was the spontaneous formation of the fermenting principle in the composition employed. The nice management of this part of the business would be to them a difficulty, and liable, no doubt, to repeated misgivings. After all the improvements of the moderns, both in cookery and chemistry, blunders in fermenting the flour intended for bread continue to be exceedingly common. If the fermentation is accidentally interrupted, or has not been sufficient, this will, afterwards, be declared by the heaviness, dampness, and other unpleasant properties of the bread. But if the fermentation has exceeded, the bread will be acidulous or bitterish, and therefore unpalateable.

LXVI. For the successful and answerable production of the fermentation, a considerable temperature, a suitable preparation of the materials, and a moderate time, are necessary. If the heat is not adequate, this particular and requisite alteration will not commence, far less be accomplished. In the temperature of 50° to 70°, this process goes on regularly, but even a higher temperature is still more favourable. If the temperature is suddenly diminished, the fermentation immediately suffers an interruption; and if it should be reduced to 32°, fermentation is thoroughly counterchecked. Dryness and diminution of temperature, therefore, are the most powerful preservatives of vegetable substances from spontaneous fermentation, concomitant decomposition, and subsequent putrescence. The ordinary temperature of tropical and some other climates, is especially contributive to this fermentative decomposition. The most convenient temperature for the commencement and continuation of fermentation, is that from 60° to 80° of Fahrenheit. In the progression of the fermenting operation, there is, almost invariably, a considerable augmentation of temperature. This is not, in the preparation of bread, so remarkably conspicuous as in the vinous fermentation. The casual discovery of the spontaneous fermentation of farinaceous substances, suggested the possibility of making bread by the intervention of this particular change of the state of the constituents; and that the leavened bread was considered more acceptable than the unfermented, appears conclusively established, from the latter being styled the miserable bread, or the bread of affliction.

LXVII. Pliny mentions that the ancient Gauls employed the fermentum, or spuma Cerevisiæ, for raising their bread. This matter was found to induce complete fermentation, and that the bread thus obtained possessed more agreeable properties than that procured by the customary and voluntary fermentation. The adoption of the plan was some time thereafter disapproved and reprobated, as has been the fate of manifold discoveries and proposals upon their first introduction. The fermentation was more speedily and perfectly performed by the yeast, and the bread rendered more grateful. In Britain, the preparation of bread by the assistance of barm has attained confirmation by statutary enactment. Collective experience has sufficiently demonstrated, that, by the aid of good barm, the most agreeable and digestible bread can be prepared. Different substitutes have, either designedly or from accidental necessity, been employed. Dr. Henry has determined, by important chemical experiment and examination, that the acidulous carbonate of oxygene (carbonic acid vulgarly denominated,) will produce the desireable fermentation, and may thus be used as a substitute. This substance has, by many, been supposed the ingredient in yeast effective of the necessary alteration. This supposition, however, from the experiments of some valuable and reputeable chemists, appears extremely doubtful, or rather altogether groundless. Although it has seemingly been proved, that yeast contains the oxygenised carbone, it has not been ascertained that this substance singularly induces the particular and requisite disposition of the ingredients. Nevertheless, the confirmation of the argument, that bread has been prepared by addition of the carbonic acid, is, from the experience of different individuals, immediately allowable. Bread, possessing grateful properties, has been repeatedly made by the employment of this substance, without any adjunct but the ordinary quantity of water, &c. necessary to give the flour the suitable consistence and tenaciousness.

LXVIII. Yeast has been lately subjected to chemical examination, intentionally, to determine what particular ingredient may serve to introduce the phænomena observeable in the bread-making fermentation. Waëstroëmb, who has investigated this article with considerable attention, separated by filtration a glutinous substance, by which deprivation, the other ingredients were rendered incapable of causing fermentation; and by the restoration of this substance, the fermenting capability was again established. This particular substance possesses several of the properties of the glutinous principle, which is obtainable from some other vegetable substances. Whether this principle, separable from barm, may be the glutinous, with a larger proportion of carbonate of oxygene, is not ascertained. It is well known, that the glutinous substance, especially when moist, speedily undergoes a modification of fermentation—and when this has made some progress, and putrefaction perhaps has also commenced, there is the evolution of carbonic air; and it is probable, that thanatode, or nitrogene, is likeways concerned in the procedure. An inquisitive examination of all these circumstances, with many others which could be mentioned, would introduce a minuteness and tediousness of disquisition, concerning elementary substances, their relative operations, influences and engendered alterations, altogether inconsistent with this publication.

LXIX. The reason of several of these observations and suggestions, will afterwards more fully appear, when the different substances are practically, but briefly, considered in the aggregate. As an argument for the propriety and usefulness of baking bread for all requiring it on shipboard, it is observeable, that yeast is susceptible of being long preserved, when in the state of dryness. That this article may be preserved, and rendered more convenient for package, and prove afterwards, by particular management, completely effectual for raising bread, has been long ago incontestably demonstrated. This article, even when in the state of arefaction, is almost immediately applicable, for the purposes of causing the necessary fermentation. This qualification is almost instantly restoreable, by the addition of aqueous moisture; and thus, bread of sufficient goodness is conveniently obtainable. By the operation of exsiccation, it may be concluded, that the carbonic air is disengaged and evaporated. The glutinous proportion of composition which Waëstroëmb has ascertained to exist in the cerevisiæ fermentum, probably suffers the separation of its carbonate of oxygene, and is thus incapable, without the requisite humectation, of producing the previously necessary fermentation. Upon the addition of the aqueous liquid, therefore, there is a regeneration or restoration of the properties needful to the desireable alteration; and this must be in consequence of chemical influence and operation. The water is very probably decomposed, and the glutinous principle of the barm becomes associated with a proportion of carbonic acid, sufficient for commencing the panary fermentation.

LXX. As good bread is so beneficial, indeed so essentially necessary, for the unhealthy, and those in a state of recovery from disease, it is adviseable that a quantity of barm, in a state of dryness, be constantly provided for this purpose. The exsiccation of this substance involves no particular difficulty; and, if properly conducted, the dried yeast is always fit for employment. The moderate temperature of the atmosphere, especially when it is not overcharged with dampness, will be adequate to the dispersion of its moisture. By spreading it upon a smooth and extensive surface, and attending at same time to cleanness, it may be reduced to the suitable degree of dryness, and then enclosed in clean and dry tin or glass vessels. When intended for use, it may be dissolved in warm water, and thus regains its peculiarities, and becomes speedily adapted to the intended purpose. Sometimes this article is required, and would be frequently serviceable, when, from want of knowledge and precaution, it is not procureable. In these circumstances, different methods have been suggested for the extemporaneous preparation of this article, or at least of an equivalent substitute. As the generality of these have a proportion of barm or malt as an ingredient, it is apparently unnecessary to enumerate the expedients which have been propounded or employed. As all ships commonly carry beer or porter, the quantity of the yeast, which is thus generally attainable, may, by the addition of a little fine sugar and flour, &c. be still further increased, if the compound is in an accommodating temperature. The common managers of these processes, perhaps, need to be informed, that the regulation of the heat of the oven, in baking bread, is a consideration of importance; and, from observation and experience, the most appropriate temperature is about 448° of Fahrenheit's thermometer. Bakers, who, it is easily understood, seldom deal in mathematical preciseness, determine the proper warmth of their ovens, by projecting a little flour upon the bottom; and if the heat is duly apportioned, this is almost immediately incinerated, and acquires blackness, without any apparent inflammation. The speediness of their preparation will be, in some measure, determinable by the size of the loaves; but a space of time, fluctuating from two to three hours, will generally be found sufficient. Covering the bread, when removed from the oven, with woollen cloths, is found to improve its properties considerably. An excellent plan, too, it may be suggested, to those who wish to preserve this article unimpaired, is, enveloping it with a cloth which is kept constantly in a state of moistness.

LXXI. As the article of bread is of singular importance, and as yeast *itself* may not always be in possession, the following observations by the Honourable John Cochrane, will not, on some occasions, be altogether inapplicable. In reference to *bread* and its preparation: "The process of making yeast, as practised at Edinburgh, is as follows: Take two ounces of hops; boil them for an hour in two gallons of water; and, boiling hot, scald eight or ten pounds of flour, and stir it very well into a paste. Do this about eleven in the forenoon. Let it stand till six o'clock in the evening; then add about a quart of yeast to forward the fermentation, and mix it well together. Next morning, add about as much more flour and water sufficient to make it into dough; and in the afternoon it will be fit for setting sponge and baking. Reserve always a piece of the old dough to mix with the new batch, instead of the yeast; which is necessary only the first time, to hasten the process. The above quantity of hops will suffice for an hundred and twenty quartern loaves.—This process in Scotland requires about thirty hours; in a warm climate a few hours would suffice, as fermentation there advances with great rapidity. A due attention must be paid to that circumstance, as every thing depends upon it. How to use the dough. Take a piece of dough and keep it for use. It will keep for several days very well. Mix the dough with some warm water, not very hot, and knead it up with some flour, to ferment and sponge. Divide the flour into four parts: mix a quarter of the flour with the leaven, and a sufficient quantity of water to make it into dough, and knead it well. Let this remain until it ferments and rises properly; then dilute it with more water, and add another quarter of the flour, and let it remain to rise. Do the same with the other two quarters of the flour, one quarter after the other, taking particular care never to mix more flour until the last has risen properly. When finished, divide it into loaves; and let the loaves remain to rise, in order to overcome the pressure of the hand in forming them; then put them into the oven, and reserve a piece of dough for the next baking. Dough thus kept, might, with proper care, be prevented from going into the acetous fermentation, by mixing, from time to time, fresh flour. This practice is particularly recommended to be followed by those persons who do not like any acidity in their bread, or have an equal dislike to the bitter arising from hops. On board a ship, this mode may be easily practised, as, from the regularity of keeping watch, the time for mixing the flour can be adhered to with great exactness. From an ignorance in the art of baking with leaven, very few ships even attempt to bake rolls for the officers, and fewer still for the ship's company."

LXXII. At the conclusion of these suggestions, Dr. Trotter, from whose Medicina Nautica the foregoing have been extracted, makes the following observations: "The above extracts are so plain, that nobody can misunderstand the directions given. The surgeon, therefore, by purchasing a quart of yeast when he goes first to sea, to begin the fermentation of the leaven, may order the process to be continued daily, so as to afford rolls for any number of sick; and we earnestly recommend this practice. The leaven here directed also possesses the quality of raising the flour-pudding, and making it light and easy of digestion. Half the quantity of leaven ordered above, will serve the whole puddings used at one meal for six hundred men, which is the complement of a seventy-four gun ship." All these considerations are of practical importance, and should not be disregarded by the practitioner. From want of knowledge or unskilfulness, or mismanagement, the bread which is prepared on board of ship is commonly bad, being either sourish or bitterish, or sometimes these two qualities are combined: it is often, also, not properly raised, but heavy and doughy, and, consequently, from all these circumstances it is frequently very unpalateable.

LXXIII. Wheat, likeways, when prepared by boiling, assumes a mucilaginous appearance; and, if the husk of the grain is carefully excluded, or previously removed; after the operation of boiling, this nutritious vegetable forms an agreeable preparation for breakfast. This decoction, which is sometimes called flummery, is prepared in some trading vessels occasionally, but more especially in coldish or boisterous weather. In the Indiamen, it is frequently employed while they are traversing the southern latitudes, and when they, again, are immersed in what may be styled a secondary winter, in that distant and stormy ocean; and then it is commonly qualified by the addition of a little spirits (rum,) and sugar, whereby it is rendered more grateful and acceptable. In boisterous and dampish weather especially, the addition of a moderate quantity of spirits may be adviseable; and, when thus administered, it will be productive of more generally and agreeably diffusive advantage and beneficial excitement, and the temporary unpleasant consequences which take place in some individuals, from swallowing spirits undiluted, will thus be commonly avoidable. When ardent spirit is unseasonably and incautiously swallowed, and received into an unreplenished and probably irritable stomach, headache, overspreading ruddiness of the countenance, the unaccountable appearance of drunkenness, and occasionally an irregular inclination to muscular movement, with a momentary, but rather injurious excitement at stomach, may be the perceptible consequences. Combined with the demulcent wheaten ptisane, however, the liquor will be less disturbing, and the serviceable consequences expected from its administration will be more congenially attainable. A sailor, it may justly be observed, is strongly inclined, and especially in chilling weather, to receive his spirits undiluted; and thus it is frequently, and even in tropical climates, exhibited without judgment, without adequate consideration of the accom panying particularity of circumstances. The momentary excitement thus produced, or even perhaps a disposition to the pleasurable feelings introduced by a state approaching to intoxication, is extremely agreeable to the common sailor, and when once thus determined, the desire for additional supplies needs no encouragement.

LXXIV. In succession, barley, another valuable farinaceous substance, comes under examination. This grain appears to have been employed in the remotest antiquity, and considered one of the principal alimentary substances. This grain was in such wonderful estimation, and emblematical of plenteousness, and so commonly used, that when the fertility of any country was described, barley was expressly considered symbolical of this productive qualification. In Britain it is cultivated in large quantities, for the purposes of the brewer and distiller, as well as that of the ordinary consumer. Barley appears to be one of those grains more particularly delighting in the moderate or temperate latitudes. Different varieties of this vegetable are observeable, but the Hordeum Distichon hybernum is most commonly reared in Britain. This article, also, is very commonly produced in all northern countries, and is capable of resisting the severest winters; and is, therefore, naturally indigenous in these territories, or certainly now is in them peculiarly familiarized. An argillaceous and silicious ground, or, in plainer terms, a sandy and loamy soil, and in which the materials have a degree of dryness and friability, within moderate compass, are favourable to its production. The plumpness and heaviness of the grains, as of those of wheat, should be regarded in choosing this article; and the thinness of its involucra, with a particular shining clearness, should also be remarkable. These, with a number of other characteristic properties, sufficiently understood by its cultivators, &c. are indicative of its comparative goodness, &c. Barley, if its moisture has been thoroughly dissipated, is also susceptible of protracted preservation. Manifold and variegated experiments have been instituted for ascertaining the constituents of this very serviceable vegetable. A very large proportion of starch is contained in this grain; and also a particular species of oil, assuming a saponaceous appearance by the conjunction of alkaline substances, and capable of burning like some of the oils obtained by expression. This article also contains some of the albuminous, and saccharine, and glutinous principles, &c.; but it is not readily reducible into bread, being not conveniently susceptible of the requisite fermentation. This unfitness for the formation of fermented bread, seems to arise chiefly or wholly from the insufficiency of the requisite proportion of glutinous principle.

LXXV. "Einhof, who analysed barley both in the unripe and ripe state, found that 3840 parts of barley in grain, afforded 430 of a volatile matter, 720 of husk, and 2690 of meal; and, from the same quantity of barley-meal, he obtained 360 of volatile matter, 44 albumen, 200 saccharine matter, 176 mucilage, 9 phosphate of lime, with some albumen, 135 gluten, 260 husk, with some gluten and starch, and 2580 of starch; 76 parts were lost in the analysis. When this meal is macerated in alcohol, it yields a yellow coloured acrid thick oil, which is supposed to give the peculiar flavour to spirits from raw grain, and to be lost in malting." The pearl-barley, as it is called, consists of roundish granules of a pearly whiteness. This should always constitute a liberal portion of the vegetable supplies of alimentary substances, appertaining more immediately to the practitioner's department. As the preparation of that useful beverage, the barley-water, is frequently mismanaged, it may not be unnecessary to introduce forms appointed for this purpose. "Take of pearl-barley, two ounces; water, five pounds;" (or about five pints, English measure.) "First wash off the mealy matter which adheres to the barley with some cold water; then extract the colouring matter, by boiling it a little with about half a pint of water. Throw this decoction away, and put the barley thus purified into five pints of boiling water, which is to be boiled down to one half, and strain the decoction." The Compound Decoction of Barley is made by taking "of the decoction of barley, four pints; raisins, stoned, two ounces; figs, sliced, two ounces; liquorice root, sliced and bruised, half an ounce: during the boiling, add first the raisins, and then the figs, and lastly, the liquorice, a short time before it is finished, when the strained decoction ought to measure two pints." Every commander and officer of a ship should be acquainted with the preparation of liquors, which may be so frequently beneficial in many distempers, and perhaps in situations when medical assistance is impossible.—Barley is very commonly supplied for the use of shipping, and should never be neglected, as it constitutes a wholesome and palateable substance, and is applicable to different purposes both for the healthy and indisposed. Barley-meal may be baked into bread with the assistance of barm, but it never attains the appearance and agreeable properties of the fermented wheaten. The addition of a little wheaten flour, or gluten, qualifies it for the formation of bread, possessing passable qualities. This grain should always constitute a generous proportion of the vegetable substances allowable on shipboard. This substance is very commonly employed in the preparation of broth, and, from the quantity of amylaceous matter which it contains, is a beneficial and antiseptic article for scorbutics, &c. and others affected with different illnesses.

LXXVI. The meal of oats is another substance which has been very generally supplied, both for the use of the navy and vessels engaged in trading. The Avena sativa appears to be more particularly the product of the northern or colder countries, and in these it has been commonly used in the largest quantities as an aliment. Different species of this grain are remarked by husbandmen, but the white is certainly the sort to be preferred. The husky covering of this grain, is, perhaps, in larger proportion than in most of the other grains generally employed by mankind. The oatmeal intended for keeping, or for distant voyages, ought to be procured from good corn, properly dried before grinding, and afterwards the branny or husky part perfectly separated. Oats are commonly deprived of their coverings for two different purposes: that it may be reduced into groats or grits, when its outward coarser coverings only are removed; and into meal, when these are first taken off, and the grain again subjected to the operation of grinding. Although this farinaceous vegetable has been almost constantly and pretty largely employed in the navy, &c. it has scarcely ever been reduced into meal of sufficient fineness. This, however, is a part of the business requiring suitable attention. If the grain, previously to its pulverization in the miln, has been thoroughly bereft of all its inherent or accidental moisture, two advantages are hereby gained—an augmented capability of preservation, and the desireable readiness of being more easily convertible into the requisite smallness. The impalpable minuteness of the meal or flour, wonderfully recommends its application, which, in a substance so beneficially employable, but sometimes liable to contempt, are considerations not to be disregarded. The dryness of the grain before grinding is commendable, and, indeed, in some measure necessary; but this is not enough; the meal should be perfectly destitute of all dampness, or it will infallibly—and more especially in great warmth and confinement—be prone to putrefactive decomposition. This article, too, may become the lodging and support of vermin, which can only be prevented by the exclusion of their rudimental introduction. It is impossible to conceive that these destructive reptiles, or vermicules, can be generated in any vegetable substances without the admittance of their primordia, which may lurk in a state of invisibility, and afterwards, with the concurrence of favourable circumstances, be evolved progressively, and thus hasten their destruction. The principal difficulty, then, consists in the exclusion of all these fundamentals of contamination, while the grain is passing through the different stages of preparation, until it be secured in suitable receptacles. This meal, it may be remarked, can be easily preserved in barrels,

&c. which have been beforehand in the state of the completest cleanness, and without a possibility of the admission of moisture; and, if these considerations are disregarded, its conservation will be impossible.

LXXVII. Oats have, as employed for aliment to mankind, been ridiculed even by people who, generally speaking, possessed tolerable perfection of judgment. Some, however, who, from their accumulated knowledge, are supposed to have considerable information in this department, think it, as a substitute to wheat, preferable to most other grains derived from the vegetable kingdom. Prepared in the form of unleavened bread, (not being naturally adapted for forming into loaf-bread,) to those unaccustomed, it is ordinarily rather disagreeable. In the naval ships it has long been commonly employed for breakfast; but some precautions appear necessary to make it acceptable, and to ensure its unintermitted employment. The smoothness and sweetness of the preparation, and which will depend upon the fineness, cleanness, and unimpaired goodness of the meal, are particularly commendable. Accordingly, in conformity to the goodness, heartiness, age, &c. of the oatmeal, the quantity of water, and the subsequent boiling, must, in some degree, be proportioned. By a careful regulation of the boiling process, the appearance of the pottage or burgoo will get considerable improvement, and will put on something of a gelatinous, or rather mucilaginous appearance, and uniformity of consistence; and, upon tasting, be sweetish and pleasant. Some addition is commonly used, however, to make this preparation still more agreeable; and, for this purpose, molasses are sometimes combined;

good small beer, and a little soft or raw sugar, for a sailor, will form a wholesome breakfast, and prove beneficial to those threatened or vexed with troublesome slowness of intestinal revolution. The addition of milk, when it can be obtained, to the pottage, will make an excellent and conveniently digestible composition for convalescents, or others needing such a modification of dietetical administration. Every marine surgeon knows the utility of oatmeal for the formation of common poultices and other purposes; and, when used with these intentions, its soundness, and due attenuation or fineness, are advantageous qualifications.

LXXVIII. Rice, although not a native of Britain, is sometimes supplied as a constituent of alimentary allowance; and, especially for the sick, is an article highly deserving of some consideration. The oryza sativa, as it is botanically designated, is a native of Ægypt, Æthiopia, &c. and is the most commonly and extensively employed of all vegetables. Millions of mankind are principally supported upon this grain, and with them, indeed, it may be called the staff of life, with emphatic propriety. The description of its manner of cultivation seems altogether unnecessary, for all who have visited the regions in which it is produced, must have observed its mode of cultivation, and some of its peculiar habitudes. In the countries alluded to, Asia and China, for example, this grain is reared in very large quantities. Particular latitudes, however, appear naturally and physically congenial to its successful cultivation and production. The parallels from the equator to 35° of northern or southern latitude, appear to have a continuance of temperature favourable to its growth and perfection. Arrian and Strabo mention this article as the food of the native Indians, as being planted in water, as producing wine; most probably the arrack. The remotest historical information supports the conclusion, that this grain has been employed, more especially in the warmer latitudes, from time immemorial. Rice, if unaffected with dampness, and the superadded influence of elevated warmth, and without any prejudicial contamination, is susceptible of almost indefectible preservation. Different degrees of fineness and goodness are observeable in this substance, in the countries where it is procureable; and this is a circumstance requiring some attention in providing it for the use of seamen.

LXXIX. The natives of the countries in which it is produced, generally eat it when prepared by the simple operation of boiling. Different substances are occasionally combined with it, according to the taste or fashion of those whose aliment it principally constitutes. Amongst the Indians it is used with fish, when this is obtainable; and, also, it is seasoned and rendered grateful, and moderately stimulating, by the addition of different aromatics. The oryza sorbilis, or Pillau of the Parsees, is, among many, a very favourite preparation. Another common form amongst the residents in tropical settlements, is combining it with different aromatic substances; this is generally known under the designation of Curry—and, if all the ingredients in the composition have sufficient fineness and goodness, and the whole carefully prepared, it constitutes a very agreeable and gently exciting alimentary composition. In Britain, the Carolina rice is commonly esteemed the best sort of this vegetable. When supplied for the sick, which, at a distance from its place of nativity, is generally the extent of its allowance, its goodness should always be considered an essential qualification.

LXXX. This valuable article would seem to consist chiefly of starch; and it is also supposed to contain a little of the glutinous or vegeto-animal substance. From the latest and most approved information on this subject, it appears that rice is composed of no less than 96 of the amylaceous principle, 1 of a saccharine nature, 1.5 of oil, 0.2 of albumen. As, in all examinations of this description, these can only be approximations to the truth, but can scarcely be viewed as absolutely ascertained. The large share of starch entering its composition, will account for its susceptibility of comparatively long preservation, and also for its being so wholesome, and constituting such an acceptable nutrimental substance. It has been commonly supposed to possess some astringent properties, and therefore has been administered from considerations of its particular influence in looseness, &c. The coarser and cheaper kinds of this grain are commonly mingled with much impurity; this proceeds partly from the heedless mode of its preparation, and from the careless manner of its preservation. This grain should be supplied both in the entire state, but with its coverings properly removed, and also in the state of fine flour: this proposal should not be neglected, as it is a consideration of much importance; although hitherto, as far as known or observed, it is a thing which has not been regarded. The entire grain may be used in various ways, either simply boiled, as it is frequently employed, or combined with some aromatics, such as carraway or coriander seeds, ginger, cinnamon, &c. and coloured with turmeric, &c. This preparation in coldish and dampish weather will be agreeable; and applied for breakfast, with the common allowance of salt beef, &c. would certainly be more beneficial in these circumstances, than the miserable coarse biscuit and water which are the famous materials generally afforded upon these occasions. The rice-flour, as previously commended, should always be kept, as this is reducible into bread, with the addition of some wheat-flour, of very tolerable quality. The most agreeable method, however, that can be adopted, would be the boiling of the rice-meal, when it will be converted into a flummery possessing an albuminous appearance. And which can be made to any assignable consistence, by a suitable proportion of water, and the duration of the boiling. And, if considered adviseable, some cinnamon, or other agreeable aromatic, may be combined; and, by the conjunction of some muscovado sugar, the whole will be made extremely palateable. When in harbour, to those labouring under different complaints, the addition of some eggs will still farther improve the composition, and make it highly desireable and nutritious to the debilitated and convalescents. And furthermore, if it can be afforded, the preparation of it with milk instead of water, will considerably increase its agreeableness and usefulness.

LXXXI. Some practitioners, but apparently without proportionate consideration, and insufficient comprehension, have presumed to condemn this substance, declaring it to be injurious or pernicious to the intestines, and producing in them a multitude of derangements and other disturbances. The vegetable kingdom produces no other substance so plentifully and so extensively employed in the maintenance of mankind. This very article, almost exclusively, constitutes the subsistence of many millions of humankind, even almost without the additional employment of any other farinaceous, and sometimes, or even frequently, without any animal substance, excepting perhaps the butyraceous preparation, there called ghee, from the milk of the cow, the poor Hindû's goddess. Observation and experience, (when they have been made with correctness, are invincible arguments,) also demonstrate the universally comparative healthiness and liveliness of those people; their indispositions or complaints are oftentimes inconsiderable, when compared with those of the flesh-eating nations—and which latter seldom or never use this grain—and are, moreover, generally more expeditely removeable. Digestion, and the accustomed operations of the intestines, in them, commonly proceed with as much necessary regularity, under the influence of rice diet, as of any other graniform substance employed; and their acuteness of vision is assuredly no where surpassed. The most remarkable inconvenience or disadvantage accompanying an injudicious or inattentive management of it in the warmer climates, or during augmented temperature in any country, is the proneness to fermentation, by which the properties of the grain undergo a considerable alteration, in which the evolution of an acid is, to ordinary observation, the most distinguishable and considerable circumstance. What acid is formed is not hitherto ascertained, or to what change of the constituent principles it is ascribable. The acidulous property may originate, not impossibly, from the decomposition of the glutinous substance which this grain most probably contains, and which is so peculiarly encouraged by the concomitance of moisture and sufficient temperature. It is not improbably a modification of the fermentation, which constitutes the requisite alteration of composition, preparative to the formation of fermented bread; and when the operation is allowed to go on, the evolution of the acetous acid, in combination with other principles, is, in all probability, the consequence. This alteration is apt to happen in rice which has been boiled in the morning, and the overplus heedlessly left surcharged with moisture, and afterwards freely exposed to the atmosphere a few hours; which will suffice for the excitement and occurrence of this decomposition. The decomposing process is sometimes speedily commenced, and makes considerable advancement in the currency of one forenoon. This change makes the rice unpleasant, and causes it to be disrelished. This inconvenience is easily counteracted; but, if once introduced, is irremediable. The accidental occurrence of this misfortune is not the sole evil; for, as sailors generally keep it in wooden vessels, if once the fermenting disposition get in them a lodgement, its successive propagation becomes, without the requisite cleanness, almost unavoidable. The aforesaid untenable accusation, therefore, is not exclusively applicable to rice; for several other grains, in such circumstances, would also be liable to a resembling alteration.

LXXXII. An inconvenience solely attributable to unskilfulness or mismanagement, should, abstractedly considered, be always unblameable, and more particularly when its prevention is almost certainly obtainable. The rice should either be boiled shortly before it is intended for use; or, if otherways, which is, however, still objectionable, all its humidity should be carefully evaporated. When it has undergone this particular mutation of constitution, as shown by the declaration of sourness, &c. seems to be the time when it may have been productive of some annoyances, and when it has been threatened with condemnation by its adversaries. Particular individuals doubtlessly may have received some inconvenience from its employment, under these superinduced modifications, in the constituents of this otherways wholesome and nutrimental substance. Looseness, and some other irregular and anomalous derangements, may occasionally be consequences, is easily conceivable, but that it is the cause of numberless, and especially of dysenteric complaints, is wholly improbable. In those not accustomed to its use, a consequence of an opposite description is perhaps more common and unpleasant; and, especially, if not accompanied with other suitable substances, it is, occasionally, in some, productive of intestinal slowness, which, in the warmer climates, as often hinted, is so particularly prejudicial. It was thus judged adviseable to exculpate an article from unrighteous imputation, which constitutes food for such a large proportion of mankind.

LXXXIII. Beans and Pease belong, according to botanical classification, to those vegetables denominated papilionaceous. There is such an intimate physical connexion amongst the properties of these two, that here they do not require a distinctive consideration. They are plentifully cultivated in all the temperate and northern latitudes, but are also capable of being reared in the tropical, but seemingly not arriving at the same perfection as is observeable at some of the British-Indian settlements. They may, generally speaking, be considered both wholesome and nutritious; and pease, especially, are very commonly furnished for the use of seamen. Pease can be converted into fine meal or flour, but are not susceptible of the alteration necessary for preparing bread by artificially instituted fermentation. The flour of these seeds has more sweetness than that procureable from most other farinaceous substances. Einhof has examined them with attention, and made some progress in ascertaining their constituents. The principal ingredients, as determined by this chemist, were the following: a substance which, from the easiness of its separation and vaporation, is styled volatile—the amylaceous, in company with a fibriform substance; the albuminous and saccharine; and also a matter which, as its properties are different from the more ordinary vegetable principles, intituled the animo-vegetable; a proportion of mucilage, and some phosphates, with earthy alkalies. The proportion of the starchy matter is the most abundant, and then come the volatile and animo-vegetable substances. The other articles belonging to this tribe, presented a trifling diversity, by containing gummy matter and a little extractive, but none of the saccharine principle has been discoverable.

LXXXIV. It appears from this investigation, that pease contain a little of the sugary matter; but neither these, nor the beans, &c. contain gluten. For the formation of fermented bread, therefore, pease require the addition of the glutinous principle, and the beans the conjunction of this, and likeways of the saccharine principle. These observations may be serviceable to those who may be inclined to associate these bodies with others possessing the capability of imparting the otherways deficient ingredients, and instituting the qualification necessary for making of bread by fermentation. The white, or garden pea, as it is called, should, in procuring this article, in general, be preferred. By exsiccation they will suffer a considerable diminution, by which two desireable advantages will be introduced,—the prolongation of their preservation, and the convenience of their stowage or package. Pease are an excellent substantial alimentary substance, and well calculated for the seaman's powerful digestion, and, what might alone be considered an advantage, is the easiness of their preservation, even in the longest voyages. They should be kept in a state of perfect cleanness and dryness. On shipboard they are generally prepared in two ways—either boiled with water, and thus forming the sailor's famous pea-soup, or made into a pudding. A necessary, but certainly neglected precaution, previously to their employment for alimentary purposes, would be the complete removal of all their coriaceous integuments, and thus the sensible properties of the pea-soup and pudding would be agreeably improved. Their appearance, when made by judicious management, should have a uniformity, and convenient and agreeable consistence ; but by the common careless plan of preparation, there are frequently disgusting roughness and knottiness, with blackness intermingled, originating from fragments of the external coverings of the pease from which they have been obtained.

LXXXV. The potato was originally imported from

South America, and translated to Ireland, by the assistance of Sir Walter Raleigh. In this adjacent island it was cultivated, long before it was established in Britain, particularly so denominated. They are obtained from the solanum tuberosum, a vegetable belonging to the class Pentandria, and order Monogynia, of Linnæus' Systêma Vegetabilium. Although the botanical classification of this article may be productive of frightful suppositions, nevertheless, experience has now indisputably established the truth and affirmance of its wholesome and nutritious properties. In different European countries, in immediate succession to wheat, it is perhaps the most extensively employed. In the British empire, it is one of the principal and most valuable alimentary substances used by the necessitous, &c. and when procureable in sufficient quantities for their adequate nourishment; none assuredly appearing to be in possession of more healthiness, more constitutional robustness and soundness.

LXXXVI. Concluding from all collective evidence, this vegetable must be considered as an indigenous inhabitant of South America: there is no mention of it in the writings of the ancients, either European, Asiatic, or African. Their introduction into Britain was a fortunate occurrence, as there they seem to prosper and succeed better than where they have been tried in tropical latitudes. Those territories, scattered from 40° to 55° of northern or southern latitude, may be considered as best calculated for the successful and plentiful production of this exceedingly serviceable vegetable. The qualities of potatoes are greatly influenced by the particular properties of the soil in which they are cultivated.

The same species of this root may be wonderfully diversified, in its sensible properties, by planting it in soils of different physical qualities; so that, ultimately, it may appear to have undergone a complete alteration in its sensible properties. Potatoes may be reared in almost any soil, but a deep loamy one, with a mixture of sand, and not too dampish, is most suitable. They are evidently and largely affected by the proportional wetness or dryness of the ground; a soil possessing a middling proportion of moisture, is to their production the most agreeable and favourable. A quantity of moisture just sufficient for their necessary nutriment, contributes most conveniently to the growth and perfection of potatoes.

LXXXVII. As this is a vegetable of very great importance for sea use, the choice of the article is a subject deserving particular attention. A wonderful and numerous proportion of different species is now cultivated; and these have got expressive appellations, according to some difference of form, or appearance of surface, &c. the particular mode of some individuals' cultivation; by which, and variety of soil, &c. at last the root is induced to assume an appropriate and characteristic peculiarity. All the peculiarities of this root are so universally and thoroughly understood, as in this place not to urge a specifical description. Among Europeans, this root has become so generally employed, that it may be said, that it is now absolutely indispensable to their sustenance. In consequence of these circumstances, it has become the subject of consideration by statesmen and agriculturists, and the examination of their properties and composition has constituted employment to chemical investigation. In scarceness of other alimentary substances—and which, it may be said, constantly supposes dearness—they have been the sole support of multitudes, either by themselves, or in variegated combination with other farinaceous substances.

LXXXVIII. Different chemists have attempted to examine the properties and composition of potatoes. Parmentier was the first on the continent who laboriously investigated the composition of this vegetable, and carefully described its cultivation, its usefulness and alimentary properties. Dr Pearson is the first British chemist who has distinctly and skilfully determined the structure and composition of the potato. Einhof, who, as formerly observed, has converted particular attention to the chemical examination of vegetable substances, has some time ago subjected this root to elaborate analytical experiments. Without reference to any particular experiments, it is easily ascertained, that the potato contains a very large proportion of water in its composition, generally amounting to four-sevenths or five-sevenths of the whole aggregate. It has been long known that they contain a considerable quantity of starch and fibrous matter, and it is likeways ascertained that the potato contains a proportion of albumen and mucilage. Some of the vegetable acids, tartaric, phosphoric, and some of the earths, lime, alumina, silica and magnesia, are supposed to enter their composition. None of the glutinous or saccharine principles have hitherto been discoverable in their composition. This circumstance, therefore, explains the impossibility of forming potatoes into bread by the customary processes, without the conjunction of some substances, possessing, in their composition, these requisite properties. The amylaceous part constitutes from a sixth to seventh of the whole compound After the aqueous humidity is completely expelled, the proportions of the other ingredients may be considered as comparatively inconsiderable. These constituents may be extremely different in their relative and absolute quantities, according to the particular properties of the potatoes submitted to examination. These ingredients, from all the experiments hitherto promulgated, apparently constitute, in modifiable proportions, this inestimable alimentary substance. Mr. Skrimshire's experiments would show, that the relatively intermedial proportion of eight varieties of potatoes, afforded about one-tenth of starch, part of which was triflingly discoloured.

LXXXIX. As, in all probability, originating from chemical alteration of constituent ingredients, and very likely the formation of new combinations, the changes commonly produced by frost, in this article, may here be slightly considered. In a moderated temperature, good potatoes are susceptible of lengthened preservation. As long as the temperature fluctuates from 34° or 36°, to 46° or 48°, &c. their capability of preservation is considerable. At the approach of the vernal season, if the temperature is slightly increased, by a natural disposition and proneness, the vegetating act commences. Closeness or confinement, with augmentation of temperature, are sometimes remarkably favourable to this circumstance. Unfortunately, however, this valuable article has a particular liability to a mischief of another description, by which it is rendered both inapplicable to its own subsequent propagation, and seemingly improper and insufficient to be administered for nourishment. As soon as there is a declension of the temperature of the atmosphere to the freezing standard, as determinable by Fahrenheit's thermometer, they suffer an alteration in their appearance and consistence, &c. and doubtlessly also in their composition. An unnatural flaccidity of their teguments, and softness of their substance, become particularly remarkable. There is a change of taste and flavour, they become sweetish; and then speedily acidulous, and this has been ascertained to be owing to the formation and evolution of the acetic acid, and thereafter the putrefactive decomposition almost immediately commences. The sweetness, subsequent to the action of frost, is considered to be produced by the generation of sugar, with the assistance of the mucilage. The other ingredients, according to M. Einhof, continued unaffected in their proportions.

XC. Potatoes, by drying, may be considerably diminished both in their bulkiness and heaviness; and hence, by one operation, two advantages of some importance are obtainable. A moderate temperature will dissipate so much of their moistness or juiciness, as to reduce their weight seventy-five-hundredths. This certainly is worthy the attention of those providing potatoes for foreign voyages. A proposal has been made to deprive them of part of their moisture by pressure, and subsequent exposure to sufficient heat, to disperse the remainder. And, also, it has been proposed to slice them, and then, by artificial drying, to obtain the same desireable purposes. This method of qualifying potatoes for keeping, has not, however, been generally experienced by application. They may be thus reduced to one quarter of their original weight, and without impairing their nutritive properties. The artificial exsiccation of this article would ensure several advantages; such as the prevention of the inclination to vegetation, and consequently of one of the causes of their spoliation and inevitable destruction ; the readiness or convenience of their stowage in much smaller compass ; and the probability of their preservation. In East Indian voyages, there are frequent complaints of the difficulty of keeping potatoes in tolerable preservation, as very commonly they have become putrescent before the outward passage is performed to the æquator. This part of the business has never been sufficiently considered, and incomparably worse understood. The succession of seasons, the changeable modifications of temperature, the periodically introduced inclination of the greatest proportion of vegetables to germinate in the spring, or which is probably tantamount, when they are surrounded with a suitableness of temperature, are considerations of inconceivable importance. In lowness of temperature, or in the cooler weather of temperate climates, and when they are still unaffected with frost, appearances remain, for some time, undisturbed, Whether there exists in these vegetables an ingenerated qualification, singularly disposing them to the assumption of these particularities of constitutional arrangement, &c. is not easily to be apprehended. Reiterated opportunities of observation give the conclusion, that this vernal disposition to germination is always accelerated by the progressive augmentation of temperature, but other circumstances not being favourable to these intentions, putrefaction is the consequence.

XCI. In determining, therefore, the likelihood of their preservation, the practicability of this, it may be observed, will be regulated by the time of the beginning of the voyage. This subject, perhaps, asks a little more elucidation, and may be thus exemplified. Institute the supposition, that a voyage commences to a distant country; but let the actual time of departure be unassigned, and, accordingly to this very circumstance, the probability and possibility of their conservation will be, in a certain degree, proportionate. Those who provide them in the vernal months, February, March, &c. cannot with propriety expect their preservation; and, agreeably to the quickness of the navigation, and consequently the progressive augmentation of temperature, so will be the hastiness of germination or putrefaction. If the voyage commences about October, November, &c. the possibility of their keeping is thereby somewhat augmented. These, and multifarious other circumstances, the specification of which would be troublesome, and seemingly unnecessary, have undeniable confirmation, are conspicuously remarkable, and should get adequate consideration from all those responsible in the management of supplying ships for remote destinations. The goodness, and sometimes, in common language, the mealiness of the potatoes, is a consideration of indispensable importance. Speaking generally, in proportion to their goodness, dryness, and cleanness, will their preservation be maintained. The species or variety of the potato, is even worthy of observance; and the kidney potato, so called from its figure, should, in common, be preferred. In selecting this root for sea use, a certain degree of roundness and compactness are always desireable properties. The potatoes which have been produced in wettish grounds, and in soils not naturally adapted to their healthful support, are altogether improper, and are more particularly liable to putrescence, &c. The dryness of this serviceable vegetable is absolutely necessary to its preservation; the sufficient removal of moisture is indeed so requisite, that their preservation, without this precaution, is impossible.

XCII. They are frequently kept, during the northern winters, in a state of accumulation in the fields in which they were produced. Excavations are formed in which they are generally collected, and, if properly protected from the freezing influence, they continue to the spring apparently unaffected. The diminution of temperature, moderate dryness, and the exclusion of the possibility of congelation, are here the only preservatives. On shipboard, however, these circumstances are not quite so manageable: there, too, they are oftentimes accumulated in considerable quantities, and in places disagreeable on account of closeness or confinement, in which ventilation is not conveniently practicable, or, what is more blameworthy, it is never thought adviseable. Surrounded with unremoved dampness, dirtiness, and, unavoidably, (in warm or tropical climates,) with augmented temperature, and also foul air, they are thus laid in the most favourable circumstances imaginable to their decomposition and irresistible destruction. The occasional perflation of these vegetables, and the removal of any sproutings, &c. indicative of germination, should never be neglected.

Potatoes, in the warmer climates, or in the warmer seasons of any country, should never be collected in large quantities, as the unavoidable compression of the undermost becomes to them very prejudicial. But, if they have been artificially dried, and accurately enclosed in air-tight barrels, all this management is a work of supererogation.

XCIII. Economic proceedings (literally, domestic ministration,) are certainly not the immediate subject of this undertaking; forbearing, however, the discussion of this reflection, this department of the disquisition is of such importance, that even what appears to grovelling observation a circumstance of no weightiness—the preparation of this esculent vegetable—is eminently deserving of some explanation. Good potatoes, when prepared by boiling, &c. should have their coats easily removeable, a whiteness and mealiness, and a farinaceous granulated appearance; upon tasting, an agreeable sweetness; and require a quantity of saliva or other liquid to give them, when upon the tongue, a degree of agglutinated consistence. The potatoes which present a watery or succulent glutinous looking surface, when broken or divided with a knife, and give in the mouth the feeling of an albuminous wateriness, or a disagreeable bitterishness, or any other uncommon impression, may justly be considered as possessing indifferent properties. They are, in vulgar language, called watery potatoes; and, for marine service, especially if the voyage is to a distance, consummately objectionable. Potatoes of this description contain a trifling proportion of the starchy matter, which, of all the constituent ingredients of vegetables, is the most incorruptible. They also contain a much larger quantity of water; they are thus more liable to putrefactive decomposition. When collected, the pressure thus produced, causes them soon to lose their natural form, they become flaccid, incline to putrescent fermentation. The same quantity affords less nourishment than good potatoes communicate, and they are always disagreeable and unpalateable. Potatoes possessing these properties, therefore, should never be employed for sea use, and are, as just hinted, altogether improper for carrying to distant voyages. They are more quickly rendered useless, either by cold or pretty high temperature, than this bulbous-rooted vegetable, when in possession of the desireable properties.

XCIV. Some attention is required in the common process of boiling potatoes; if this operation has not been knowingly conducted, even potatoes of tolerable quality will be otherways not near so agreeable. Good potatoes, by misconduct in their preparation, may even undergo deterioration of their sensible and ordinary properties. The teguments or coverings of potatoes, most probably, contain some constituents or arrangement of these, not subsisting in their intimate structure. They are frequently bitterish, and have a flavour different from that of the other part of their substance. Continuing the operation of boiling, this particular property commonly disappears, and must, therefore, be soluble in the boiling liquid; and, in this manner, is rendered separable from the other ingredients.—That the influence of the heat may be as equally imparted to the potatoes as possible, in preparing and classifying them for boiling, this should never be overlooked. An equality of size, therefore, should determine the propriety of selecting them for the purpose of simultaneous preparation. The proper quantity of water should be added before they are subjected to the operation of boiling, and, also, that the quantity be sufficient for covering them; but, concerning this culinary proceeding, there has subsisted diversity of sentiment. As the boiling continues, evaporation will be proceeding; the occasional addition of some boiling water, more, especially, if the potatoes are large, may, therefore, be required. The process of boiling should not be too rapidly conducted, otherways, the outer layers of the potatoes will crack and separate, and become mingled with the water, while the inner continue in a state of rawness. The water should be removed before they are completely or perfectly boiled, and then they may be exposed in a convenient vessel until all the remaining moisture is fully evaporated. This conclusive part of the proceeding, if properly conducted, will evidently and materially improve their sensible properties. By skilful cooking, even potatoes of middling qualities may be considerably and pleasantly improved. A singularity of this vegetable, is its insolubility in water after the operation of boiling; although it is generally known, that potato-starch is reducible by the assistance of this liquid, at 212°, to a homogeneous transparent gelatinous consistence. There is a probability suggested, that the constituent substances are afterwards so intermixed in their association as to form an insoluble compound. The particularity of this arrangement, which makes them indissoluble, and only diffusible, &c. in watery liquids, remains to be investigated.

XCV. Potatoes by themselves cannot be formed into bread; they want one of the necessary component substances—that is, the glutinous principle. The addition, however, of some wheat-flour, will supply the deficiency, and fit them for that purpose. Different proportions of the flour have been employed; from half, to two-thirds or three-fourths, of their absolute quantities, have been conjoined. The addition of the glutinous principle, uncombined, would answer the intended purpose. The dryness and goodness of the potatoes, are, for the formation of pleasant bread, essentially requisite. As potatoes, in succession to wheat, may be considered one of the most important and nutritious vegetable substances commonly furnished to the seafaring, not only the simple preparation of it is an object of moment, but also the agreeable institution of modifications and combinations of its preparation. In Ireland, where it supplies nutriment to so many of the human race, the potato is commonly preferred, after the process of boiling, with the addition of a little salt or milk: this mode, from its familiarity, it is said, is frequently the most acceptable. As just suggested, the potatoes may be reduced with the union of wheaten flour into bread, by the interposition of fermentation; or they can be employed whole, after the operation of boiling. This root can likeways be prepared by roasting; or it may be parboiled, and roasting may conclude the operation. For the indisposed and convalescents, &c. they may be prepared by boiling; and being deprived of their coverings, then pounded or beat into a fine pulp, with a little butter, &c. and eaten with milk, they will constitute a light and agreeable nourishment. At sea, however, milk can scarcely be expected, and, perhaps, the best substitute will be some treacle and small beer, in combination. By thus diversifying the preparations of even the same individual substance, the tastes of different persons will have the probability of being gratified; or occasional variations may, to individuals, be unexpectedly acceptable.

XCVI. In foreign climates, the East and West Indies, for example, another alimentary bulbaceous substance is indigenous, and often used by the natives and extraneous residents. This article is the Yam, the Dioscorea sativa, of the class Hexandria, and order Dioecia, which is a native of Ceylon, the coast of Malabar, &c. Two species of this vegetable, the whitish and reddish, are principally observeable and cultivated. This vegetable seems to have been peculiar to Asiatic regions, where it flourishes independent of the assistance and interference of mankind, and is naturally a substance of durability and spontaneous propagation. The yam has been transferred to the West Indian islands and to America; and in these countries it is carefully cultivated, and largely used as aliment for the negroes. The white species is the finest and most esteemed, but the reddish is the most productive or fruitful. This is a vegetable which thrives and prospers even in soils of middling qualities. Considered as alimentary substances, they appear to possess properties nearly similar to those of potatoes; but they have not been examined in their composition, and, therefore, the particular ingredients are undetermined. In the unboiled condition they are tenacious and clammy, or viscous, but when properly prepared by boiling, they undergo an alteration; and if the root possesses sufficient goodness, and their moisture is evaporated, they become granulous and deprived of their viscidity. A particular advantage of this root, is its susceptibility of being long kept, even in its native climate; and this seems to originate principally from the defensive firmness, toughness, and durability of its involucra.

XCVII. Continuing homeward voyages from India, China, &c. sufficient supplies of this serviceable vegetable should always be provided. They may either be collected, &c. in their natural condition, after suitable drying, or they may be sliced and dried artificially, and then packed as may now be conveniently understood. But, as the yam, in its ordinary leathern coverings, appears capable, by moderate exsiccation, of keeping for six or eight months, this may be considered a capability of preservation of sufficient continuance for fulfilling any necessary purpose. The cooking, even of this simple article, is sometimes mismanaged. Equality of the size of those boiled together deserves attention, as the influence of this operation will, on that account, be more properly and precisely apportioned. After the boiling has proceeded to a suitable pitch, they will be much improved by slicing them, and afterwards exposing them in a vessel adapted to the purpose, until their moisture is completely evaporated. If these different culinary processes have been carefully conducted, and the yams of original tolerable qualities, they will approach very nearly in their apparent properties, to those of the best potatoes. As the potato, too, they naturally contain a large quantity of moisture embodied in their physical structure; and, if this is allowed to remain, and especially in those of indifferent qualities, they are disrelished, are unpleasant, and have a disagreeable viscidness. Yams may, likeways, be, after the customary operation of boiling, and also the removal of their coverings, prepared by pounding or beating into a sort of pudding; and, if afterwards expanded by pressure, and then again moderately dried, they will be much more agreeable.

XCVIII. The vegetable substances, and preparations therefrom obtainable, which have previously been enumerated, are serviceable, and some of them indeed indispensable. Some other vegetables, however, might certainly be more frequently and beneficially introduced. The common Carrot, the Daucus Carota, is a valuable and an agreeable vegetable, and admirably fitted for blending with salted animal substances. There is scarcely any other substance of this description so pleasantly suitable for combination with the employment of salted flesh-meat. This vegetable, moreover, appears considerably empowered in counteracting the effects of the protracted use of salt provisions. The carrot contains a considerable proportion of the saccharine principle, in conjunction with mucilage, &c.; it is conveniently digestible, and at same time nutritive. When the season or occasion answers, these should always constitute a part of the supplies for a ship's company. They possess the property, too, of considerable preservation; if packed in dry sand, they will, in moderate temperature, remain for a length of time in good condition. A certain degree of dryness before this package is requisite; if this is not duly regarded, an inclination to putrescence will commonly be speedily observeable. For delicate purposes, the use of the sick, &c. for instance, they may, having been properly cleansed, and all putrescent or decaying points or particles being carefully separated and removed, be covered and packed with raw sugar, or they may be formed into a marmalade; and thus, afterwards, when perhaps few other fresh vegetables are procureable, be acceptable and serviceable to those threatened with a tendency to scorbutic indisposition, &c.

XCIX. The common garden Parsnip, the Pastinaca sativa, is another root which, when to be got, should always form a part of a general collection. The parsnip may be preserved in a manner similar to the foregoing vegetable. This vegetable also may be subdivided longitudinally, and then cautiously deprived of all its useless moisture; and may then be preserved in the longest passage in a state of tolerable perfection. And, before boiling, it should be immersed for some time in warm water; and, when thus skilfully prepared, the root will regain, almost perfectly, its primitive properties. A precaution necessary to be suggested concerning this vegetable is the following: that there is a particular season suitable for collecting it in proper and salubrious condition. It has been observed, that when this root is allowed to remain under ground during the winter, that, towards the vernal season, it appears to possess poisonous qualities. The proper time for gathering the roots for use or keeping, is when the foliage assumes a tendency to decline. The termination of autumn, or beginning of winter, will, therefore, be the adviseable season for its collection and adaptation for conservation.

C. There is no intention of specifying every vegetable which may be furnished for sailors in harbour, but principally those which may remain for a longer or shorter period in tolerable preservation at sea; and, therefore, be serviceable when supplies of succulent materials are otherways not obtainable. The description of the numberless multitude which might be introduced, would be an interminable employment, and, more correctly speaking, unnecessary; and, in some measure, unproductive of any demonstrable advantage. Some others, therefore, shall be cursorily considered, which may either be generally useful, or more peculiarly applicable to the complaining or to convalescents. A favourite preparation, formerly employed, was the Pickled Cabbage, by the Dutch called Sauer Krâut, and largely employed by them in the flourishing time of their navigation. These were exhibited for the prevention of scorbutic affection; but, for this purpose, it is extremely probable that they have no intrinsic beneficial properties. They are conserved by the addition of vinegar, (which, indeed, is probably the only serviceable ingredient,) with which they are allowed to assume a commencing act of fermentation; and muriate of soda, and sometimes aromatics, are then conjoined. None of the varieties of cabbage are capable of lengthened preservation, excepting when they are commixed with some other antiseptic substances, such as those mentioned, when they are nearly in the condition as obtained by the common operation of pickling, excluding the occurrence of incipient putrescence. Although they have been commended and frequently employed, when thus slightly fermented and pickled, it is impossible to suppose any plausible explication of their imaginary usefulness, unless it be deriveable from the vinegar with which they are in combination. The cabbage, separately, is a vegetable peculiarly and speedily obnoxious to corruption; and, more especially, if it has been previously exposed to a considerable diminution of temperature. The fermentation, or circumscribed decomposition, before they are put to the operation of pickling, seems to be rather unfavourable than advantageous. They undergo an alteration which is afterwards never recoverable, and by which their ordinary properties are evidently and materially transmuted, and their propensity to putrefaction wonderfully accelerated. The completion of this putrefactive decomposition is opposed or interrupted only by the vinegar and muriate of soda. A small quantity of pickled cabbage, but prepared immediately whilst possessing their healthful properties, is certainly allowable, and will form, with salt meat, a pleasant condiment.

CI. And before finishing this division of the general subject, it may, perhaps, neither be deemed irrelevant nor impertinent to suggest some observations upon different articles which are occasionally employed; not so much for promiscuous subsistence, as for assistances more particularly applicable to the enfeebled, the exhausted, those labouring under complaints, and for convalescents. And of these auxiliaries the subsequent may be considered to be the principal. Cassada or Cassava, Sago, Salop or Salep, Indian Arrow-root; to which may be subjoined, Starch, Sowins, and a diversity of other vegetables, &c.—The Jatropha, from which the Cassava is obtained, is a native of South America, belonging, by botanical nomination, to the family Monoecia, order Monadelphia, and genus Tricocca. Of this vegetable there are several varieties: the species Manihot and Janipha are those especially employed for alimentary purposes. The first is called the bitter, the latter the sweet cassava; so designated from the sensible qualities they have when in a recent condition. The bitter, or manihot, is possessed of poisonous properties, but can be separated from them by the customary processes used in its preparation. The roots are cleared of their coverings, and the internal pulpous substance subjected to pressure, and its native humidity is hereby removed, in which its noxious qualities are supposed to be more especially contained. The remaining farinaceous substance is carefully depurated by repeated ablution, &c. and then exsiccated.—The Tapioca is nothing but the farina or fine flour of this vegetable properly separated from the fibrous parts of the roots. This article appears, generally considered, to have the ordinary properties of the wheaten starch. The cassava may be baked into cakes, or formed into pottage, with water or milk, or converted into pudding, according to the apposite intention.

CII. Sago, well known by name, is a native product of the East Indies, &c. where it is obtained from the Cycas circinalis, a species of the palm-tree, peculiar to the Molucca islands, and various other Asiatic districts. This magnificent tree is plentifully produced in Malabar, where it arrives at a graceful proportion of loftiness. This constitutes a valuable or serviceable vegetable to the inhabitants; supplies a farinaceous nutricious substance; and, to them, is capable of answering different other useful purposes. The medulla or pith of the tree is, for some time, steeped in water, and then strained; during which proceeding, the amylaceous matter is transmitted, and the more impure and insoluble materials are intercepted, and thus conveniently removeable. The starchy matter carried through with the water is permitted to subside, the liquid is cautiously evacuated, and the remaining moisture being properly disengaged, it is now by the natives easily formable into cakes, or prepared in any other way considered the most agreeable, convenient, or desireable. The sago which is commonly imported into Europe, is obtained from this article more minutely comminuted, and afterwards artificially granulated. It would surely be needless, in this place, to distinguish the diversified purposes this article is either supposed or calculated to answer, or the different forms of its preparation. This must be regulated by the manifold circumstances accompanying the particular instances in which it may be deemed employable, and ought frequently to be manageable conformably to professional prescription.

CIII. Salop or Salep is likeways another vegetable substance sometimes used; but, generally speaking, that imported from the Levant is too expensive for ordinary consumption. By moderate attention, a sufficient quantity of the orchis, from which this is procureable, might be reared in Britain. This vegetable, of which there are about fifty species, is of plentiful production in the Persian, Assyrian, and Turkean countries; and there it is commonly and extensively used as a nourishing substance. Different species of it are indigenous in Great Britain. For the purpose of procuring the salop, the orchis mascula is the most esteemed.

The proper season for collecting the roots is when the seed is fully formed and the stalk tending to decay, because the new bulbous roots, from which the salop is directly prepared, is then in the fittest condition. After the radicles and coverings of the roots are removed, they are deprived of their moisture by moderate arefaction, and then pulverized. This is considered a valuable, salubrious, and nutritive substance; but, as stated, its price will probably preclude its general adoption. This, however, is a remediable inconvenience, for it might be cultivated in England in quantities proportionate to any requisite consumption.

CIV. The Indian Arrow-root, as it is foolishly denominated, is sometimes administered as a bland and nutritious food to convalescents, &c. The Maranta, or Indian arrow-root, claims kindred with the family Monandria, and the order Monogynia. This herbaceous perennial is natively produced in the Indies, and contains five species; that, with the adjunctive Arundinacea, is the genuine starch plant, and generally employed for alimentary purposes. The maranta galanga is employed by the natives for extracting the poison conveyed by their envenomed arrows, from which the English name, arrow-root, imposed upon all the species in aggregate, is deriveable. This vegetable is also cultivated in the West Indies. The roots are cleansed, then beaten, and mixed with water; the fibrous matter is separated, the watery liquid holding the soluble portion is filtrated, or the operation is rather performed by straining; the suspended substance is allowed to be deposited, the liquor drained off, and another quantity of clear water added; the farinaceous substance is thus deprived of all its impurities, and afterwards, by exposure, reduced to a state of sufficient dryness. This is an useful nutrimental preparation, conveniently yielding to the operation of digestion, and therefore accommodated to supporting those under complaint, or revalescent from sickness. The purchaser of this article should pay some attention to its properties, otherways the potato-starch may be artfully substituted or intermixed. The amylaceous part of potatoes, indeed, blended with a little pulverized tragacanth, is the substance so commonly vended under the specious and unjustly applied epithet of arrow-root. If this compound be deemed equivalent, the nautical surgeon, therefore, can surrogate this substance, by procuring the ingredients, and mingling them, conformably to his consumption, or particular circumstances in which its exhibition may be considered expedient.

CV. Maise, or Indian Corn, is a very durable and productive vegetable, and is a very nutritive and wholesome dietetical substance. The flour of this grain is capable of continuing long without undergoing those destructive alterations, to which the flour of wheat, and several other farinaceous vegetables, are so peculiarly obnoxious. It constitutes the principal food of different Indian nations; unleavened bread is the form in which they generally eat this vegetable. This grain has not been properly examined, and therefore its composition is not completely ascertained. There is a probability, however, that it holds a considerable proportion of the starchy principle. Fermented bread cannot be made from its flour, without the addition of something containing the glutinous and saccharine principles, or probably having these two in combination. The adjunction of a little wheat-flour qualifies it for the formation of bread, by the interposition of artificially raised fermentation. Administered to those not habituated to its employment, it occasionally possesses some laxative influence, which, in many constitutions, upon first entering the warmer climates, may be thought a profitable occurrence. By blending it with the flour of wheat, when intended for making biscuit, the durability of this necessary article seems to be considerably augmented; which, in voyages implicating an indetermined prolongation, is a circumstance of very material importance. This, perhaps, is the reason that American biscuit is often capable of longer keeping than the common English. The biscuit, of which it forms a part, has a peculiar sweetness, compactness, and glossiness, which, in that prepared from the wheaten flour, are not so remarkable. The yellowish or cream colour, likeways, which the maise-flour communicates, is a particular characteristic. It is very possible to carry some of this grain at sea; and, by a suitably contrived grinding machine, some of it might be reduced into the state of flour, as occasion might require.

CVI. Experience and observation have incontestably demonstrated, that, although man appears naturally inclineable to feed upon a farraginous accumulation of animal and vegetable substances, nevertheless, a very few are sufficiently able for his maintenance. Among the seafaring, as well as the terrestrial inhabitants, variety is charming; and to those struggling with indisposition, the practicability of occasionally diversifying their food, is peculiarly acceptable, and sometimes unexpectedly beneficial. The ingenious and attentive surgeon will, therefore, have satisfactory employment, in particularizing and appropriating a multitude of dietetical substances, in conformity to the need of individuals. As the prevention of disease is so eminently agreeable and necessary in the public service, so the judicious collection of the suitable remedies is a consideration of indispensable importance. Whether these may be dietetically or medicinally denominated, &c. is a thing of consummate indifference, if the desireable consequences be therefrom obtainable. A multitude of these cases require delicately prepared vegetable nutriment; a sufficiency of these, then, with a moderate proportion of suitable flesh-meat, will be admirably serviceable.

CVII. "The arrangement of a medicine-chest, and a pompous formula medicamentorum, are trash, compared with these comforts, to a sea life. A sea life affords the strongest evidence to be found, of mankind living, for a length of time, on a particular diet, without change, sometimes for a year together, without either the appetite failing, or the stomach rejecting it. I apprehend this is chiefly owing to the stimulus of the muriate of soda, which preserves the beef and pork, and seems so grateful to the human stomach. Fresh beef and fresh pork are soon disliked, and produce nausea. I have more than once, at sea, been sick with the use of fresh pork, turtle, and poultry. Mr. Pritchard, a master in the navy, mentions an instance, where the purser gave two fowls, each weighing three pounds, for a piece of beef. These were much relished at first, but were soon disliked by the seamen, who returned with pleasure to their salt meat. He also remembers when the late Lord Rodney ordered fresh pork to be supplied in 1769, of which the seamen soon tired, and refused to eat it. Captain Tregent of the marines, relates the same of turtles used in King's ships; and similar effects have been observed by other officers. The crew of the Ville de Paris had so much fresh beef off Ushant last summer, that they longed to be put upon salted provisions."

CVIII. An alimentary preparation, which has occasionally been employed in the navy, but scarcely in ships of burden, is flummery or sowans; by some spelled and written sowins. This preparation constitutes a wholesome, nourishing, and agreeable food, for scorbutics, convalescents, &c. This article is commonly procured from that part of oatmeal which remains mixed with the broken coverings, after the separation of the finer mealy part by sifting. These (the husky, with the grosser part of the meal,) are infused in water of a moderate temperature—70° to 100° will be sufficient—and the mixture is set aside until it becomes acidulous. By the assistance of a sieve, the mixture is strained. The aqueous liquid is percolated, carrying along with it the amylaceous and glutinous substances, which afterwards are principally precipitated. The crudities and thickish materials, having been retained upon the searce, are easily removeable. After the subsidence of the substances diffusible and transiently suspensible in water, the acidulous and discoloured liquor is withdrawn, by decantation, and an equivalent quantity of warm water is superadded. This latter process is sometimes repeated until the watery infusion comes off colourless, and almost tasteless. In proportion to the preparative fermentation, and this subsequent management, will the sowans have an agreeable acidulo-sweetness, or an unpleasant bitterishness or sourishness. A suitable proportion of water is ultimately added, and the whole committed to boiling, continuing which proceeding, the mixture should be carefully and almost incessantly agitated. The operation of boiling, regularly prosecuted, the sowans pass through different gradations of consistence, and finally assumes a disposition to congealing, or coagulation, when the action of the fire is suspended; it puts on a uniformity of thickness, and smoothness of appearance. The pudding, for such it may be called, possesses a peculiar agreeable flavour, has a sweetness, in company with an agreeable sourness; but if the whole business has been knowingly performed, the sweetness will commonly predominate. This preparation may easily be got ready, in any necessary quantity, and makes not an unpleasant article to all those requiring such gentle alimentary assistances. It possesses a tendency to promote moderately the regularity and sufficiency of intestinal evacuation, which is frequently so serviceable to those constitutionally or accidentally incommoded with costiveness. The sowans should be frequently employed in the tropical latitudes, where they would constitute both a wholesome and comfortable breakfast. The addition of milk is wonderfully conducible to rendering them more desireable and palateable; but, generally speaking, this is difficultly procureable, and at sea impossible; and therefore molasses, &c. may be substituted; or to the debilitated and convalescent, wine and sugar will form a beneficial combination.

CIX. Fruitage always constitutes an agreeable part of a dietetical collection for marine purposes. In that prodigious expanse of the earth's surface, included and terminated exteriorly by the tropical circles, and also in every country occasionally submissive to the power of augmented temperature, the succulent and acidulous fruits are peculiarly desireable and grateful. Unluckily, however, for marine use they must be kept in a state of dryness, or previously undergo some artificial preparations, to render them susceptible of conservation. A diversity of fruits are capable of being secured, for some time, in the form of conserves and marmalades; but this implies expense, and, therefore, commonly excludes them from the hapless seaman. The raisins, currants, &c. are the articles most generally supplied, and used, along with suet and flour, &c. in the formation of puddings; and in these are pleasant and useful. They are vegetables exposed to merciless depredation, from almost every reptile to which they may be accessible, and, therefore, need to be properly defended. They are frequently the residence of the rudiments of various insects, their excremental depositions, and manifold other impurities, by which they are soon corrupted, and ultimately destroyed. After suffering this spoliation, they are offensive and injurious, and in this condition they should never be employed.

CX. Mustard, although not affording any nourishment, yet, along with salted provisions, as a condiment is generally relished, and supplies an agreeable poignancy, and moderately stimulates the stomach. The addition of a little good vinegar with the mustard is also commonly allowed. A small proportion of fine mustard, diffused in pea-soup, would give it some sharpness, and be the most suitable and harmless mode of its exhibition. (" To render pea-soup or barley-broth pleasant and palateable, fry onions in butter, and pour into the soup.") Why this article should irritate and inflame the surface, and, in moderate quantities, not sensibly disturb the stomach, appears an occurrence which cannot be thoroughly explained. The mustard should be preserved in bottles, otherways, in the course of a voyage, it will be considerably impaired. Vinegar, oil, &c. will be considered after the secondary division of this chapter, and immediately before the promiscuous observations which will be suggested upon alimentary substances, collectively considered. These irregular and compendious observations, upon the primary division of this subject, being premised, the other now naturally appears as the groundwork of some discussion. And, as an essentially and absolutely necessary article, the most universal, plentiful, and serviceable of all fluids, Water, naturally and deservedly occupies the precedence.

CXI. WATER is one of Nature's most abundant and beneficial productions, and constitutes the principal and most extensive proportion of every liquid or fluid in existence. This was the primitive and most salutary, or rather the original liquid designed for the general use of all mankind. This fluid, when completely disengaged from all extraneous substances and impurities, may justly be considered to be the most salubrious which benevolent Nature has appointed for her rational, or, certainly, for her animated offspring. It is positively necessary for their welfare and existence. In the remotest and happiest conditions of mankind, it was always held in admirable estimation. A draught of cool water to the wayworn and sitibund traveller, was regarded as a particular indication of friendship and kindness. This harmless ordinary beverage of antiquity, was as sincerely esteemed as the diversified liquors now so commonly and diffusively employed. A single well or fountain, favourably situated in a territory otherways difficultly furnished with this needful article, was accounted a peculiar blessing. In those primeval days of integrity and simplicity, when temperance sweetened the bowl, and moderation the repast, plainness of manners, friendship undisguised, and healthiness unassailed, were some of the constituents of their enviable but terminable happiness. Information collected from the suffrages of antiquity, as historically transmitted by authenticated communication, would lead to the reasonable conclusion, that this elementary liquid supplied mankind for a long time previously to the obtainment and employment of liquors by fermentation. These latter liquors are mentioned by Dioscorides, Theophrastus, Democritus, &c.; but of what description or qualification, from the imperfection of their statements, is indeterminable. Vinous liquors, which were probably the juice of the grape, not much changed, and therefore styled the pure blood of the grape, were, however, not unknown to the ancients. They are mentioned for the first time about A. M. 2348. The first sorts of these fermented liquors were, in all probability, procured from the grape, a vegetable flourishing so abundantly in the temperate latitudes. The frequent expression, vineyards, their cultivation, and vintages subsequently thereunto, and the concomitant merriments, all conspire to strengthen the supposition, that weak wines were the first employed for the excitement of exhileration and pleasureable intoxication. "And Noah began to be an husbandman, and he planted a vineyard."—"And gladness is taken away, and joy out of the plentiful field, and in the vineyards there shall be no singing, neither shall there be shouting: the treaders shall tread out no wine in presses; I have made shouting to cease."

CXII. The examination of the original beverage of man is, however, the present subject for attention. The different properties and special qualities of water, were subjects of animadversion and investigation even among the ancients generally, and their physicians in particular. They began very early to apprehend the propriety of having their fountains in particular situations, knowing from observation and experience, that water was very materially modified in its qualities by the physical conditions of the earth where it was obtained. Hippocrates, who was an assiduous observer of physical occurrences and revolutions, also bestowed a diligent attention upon this important subject. This careful observation of its properties proceeded from different reasons, especially from its extensive and absolutely requisite employment by mankind; and particularly in those days, from its application both internally and externally, as one of their most beneficial and efficacious medicinal instruments. The forenamed physician, in his book, *περι αερων, ὑδάτων, τόπων,* furnishes on this subject a multitude of observations, which evidently announce the great interest he took in those matters, which affected the health, &c. of mankind. Waters, which have been in a state of stagnation and consequent corruption, are considered as improper; those of marshes, lakes, and those which may have been motionless, are laid under the same condemnation; and there follows a catalogue of afflictive diseases, supposed to be produced or excited by their protracted employment. He likeways discommends those waters evolving themselves in stony places: *δεύτερα δὲ ὅσων εἷεν αἱ πηγαὶ εκ πετρεων. σκληρα γαρ αναγκη ειναι.* And also those discharging themselves in places where the following mineral substances may exist; and, moreover, he subjoins his reasons for disapprobation: *ἢ εἴτε ὅκου θερμὰ ὕδατά εϛιν. ἢ σιδηρος γιγνεται. ἢ χαλκος. ἢ αργυρος. ἢ χρυσος. ἢ θεῖον. ἢ ϛυπτηρία. ἢ ασφαλτον. ἢ νιτρον. ταυτα γαρ παντα ὑπο βίης γινονται του θερμου.* These are all deriveable from the powerful influence of fire, nor can good water proceed from earth having these qualities. They are hard and warm, as he expresses it, are difficultly rendered by the urinary passages, and favour a costive disposition. And a large spleen, and a bilious and tumified hepar, are not forgotten. He commends those waters proceeding or issuing from elevated places: *αριϛτα δέ ὁκόσα εκ μετεώρων χωρίων ῥέει και λόφων γεηρων, αὐτα τε γαρ εστι γλυκέα και λευκά.* These, he says, come from the deepest fountains: *εκ βαθυτάτων πηγεων.* He commends those fountains particularly which look towards the sunrising—*γαρ λαμπρὸτερα εἶναι και ευώδεα και κουφα*—because they are more transparent or colourless, have an agreeable flavour, (or, probably, he inclined to be understood that they conveyed no odour which would be disagreeable,) and that they are light. After a diversity of observations not peculiarly applicable to seafaring gentlemen, this may be transcribed as his conclusive determination, that the *ὕδατα τα γλυκύτατα και κουφότατα και λαμπρότατα*; or those which are sweetest, lightest, and most limpid, are the most commendable.

CXIII. Celsus, in his account of the ordinary properties of water, is circumstanced and circumscribed by his customary pithiness and conciseness: "Aqua levissima pluviatilis est; deinde fontana, tum ex flumine, tum ex puteo; posthæc ex nive, aut glacie; gravior his ex lacu; gravissima, ex palude. Facilis etiam, et necessaria cognitio est naturam ejus requirentibus. Nam levis, pondere apparet; et ex his, quæ pondere pares sunt, eo melior quæque est, quo celerius et calefit et frigescit; quoque celerius ex ea legumina percoquuntur." These transcriptions, with manifold others which are producible, are remarkable confirmations of the particular attention bestowed upon the consideration and examination of this essential and important substance, by the most illustrious and intelligent physicians of antiquity. From the insufficiency of their knowledge, their chemical especially, they confessedly did not understand this matter so thoroughly as the moderns; but some of the affected distinctions of the latter are miserably benighted when brought in competition with those of the sages of antiquity. Excluding the assistance of chemistry, which the latter did not certainly possess, the clearness of their investigations surpasses all expectation. Galen, de Simp. Medicin. Facult. says, "Aqua quæ est purissima, tribus sensibus judicatur, gustu videlicet, visu; olfactu; gustu, si nullam planè qualitatem præ se ferat, sed videatur ab omni qualitate immunis: visu, si pura, sincera, et exquisitè clara: olfactu, si eorum nihil est, quæ in aquis vitiosis esse olfactus testatur, ut aciditas, putredo, acredo, salsedo, aliquodve aliud vitium, quod nomine caret." He also institutes a distinction betwixt water carrying the best and worst qualities. "Quod siquis est, qui ex notis potius vim ejus prænôsse malit, cujus fons et petra scaturiens contra septentriones fluit, solemque aversum habet, hanc ægrè concoctum iri, tardique transitus esse, putandum est: eadem calefit, frigefietque tardè: Contra, cujus ad Orientem solem fons erumpit, quæque per meatum aliquem mundum, aut puram colatur terram, eademque calefit ac refrigeratur ocyssimè."

cxiv. The importance of the subject appears to be perfectly established by the most respectable and indubitable authorities of antiquity; and, what is more, hath obtained confirmation by universal concurrence and acquiescence. The Grecian Iatros enumerates the advantages obtainable from either the outward application of water, or its internal administration. He distinguishes also the manifold distempers supposed to be engendered or aggravated by the use of this liquid when occupying improper or unhealthy properties. And he, moreover, particularizes the beneficial consequences of it, when good, in the prevention or alleviation, or in the cure, of different complaints.—These recordations, with multifarious other authorities and illustrations which might be accumulated, sufficiently demonstrate the propriety, the necessity, of adequate attention to a matter of such inseparable importance in every contrivance and administration calculated for the preservation of healthiness. The following quotations will declare, that the obtaining and goodness of water were important considerations even with the most favoured people of antiquity, and whose history is the most indubitably authenticated. "And God opened her eyes, and she saw a well of water; and she went, and filled the bottle with water, and gave the lad drink."—"And Abraham reproved Abimelech, because of a well of water, which Abimelech's servants had violently taken away."—"And he said, For these seven ewe-lambs shalt thou take of my hand, that they may be a witness unto me, that I have digged this well."—"For all the wells which his father's servants had digged in the days of Abraham his father, the Philistines had stopped them, and filled them with earth."—"And Isaac digged again the wells of water, which they had digged in the days of Abraham his father; for the Philistines had stopped them after the death of Abraham: and he called their names after the names by which his father had called them. And Isaac's servants digged in the valley, and found there a well of springing water."—"And Caleb said unto her, What wouldest thou? Who answered, Give me a blessing: for thou hast given me a south land; give me also springs of water. And he gave her the upper springs, and the nether springs."

cxv. A number of distinctions have been applied to water, conformably to the properties of the place in which it is procureable, and from the supposition of its having diversified qualities, according to those physical peculiarities, and accidentally communicated impregnations. Thus the moderns, without any acknowledgment to their predecessors, enumerate river water, well water, spring water, lake water, marsh water, &c. and without any determinate advantage. If five or six subdivisions are allowable, any other indefinite number may, with propriety, be introduced. It is modifiable, in what situation soever, by the peculiarity of circumstances to which it may be exposeable; for example, well water may be more impure than river water; and this latter more contaminated than lake water. These are often inapplicable and insignificant distinctions, hypothetical, and authorize no invariable dependance in determining their properties, in collecting this inestimable substance. The transparency or limpidness, the comparative heaviness and lightness, the sweetness, or rather tastelessness, of this fluid, were amongst the ancients judged the chief of its more remarkable characteristics. Pure water should be absolutely transparent, colourless, tasteless, and flavourless; and even all these are not unconditional demonstration of its perfect freedom from every conceivable impregnation. This desireable pureness is only obtainable by distillation. As this fluid generally exists, it is undoubtedly contaminated with innumerable heterogeneous substances, with which it either continually or accidentally may be mixed; and whether this is effectuated by chemical or mechanical influence, dissolution, suspension, &c. In this manner, any substance whatever, which is dissoluble or suspensible in this liquid, at one time, place, or other, may therewith be associated.

CXVI. Water is always existing in three different forms and degrees of consistency or condensation, and in this disposition it has a very remarkable singularity. Its different and variable gradations of rareness and condensation, are wholly depending upon the changeable circumstances of temperature. This substance exists in the state of water, the subject of these discussions, in the form of steam or vapour, and in that of ice, or in the state of congelation. The first is the most natural and useful, and in which state it holds, more strictly, in the English language, the name of water. The condition of ice is the second in which it would continually remain, if the influence of caloric never rose above 32°; and in that of vapour, in which condition it is supported by the presence of a certain dose of caloric. The composition of water was altogether unknown to the ancients, and by them it was considered an elementary substance, but necessary for supporting and nourishing the vegetable and animal kingdoms. The notable Sir Isaac Newton, with his unusual sagacity, suspected that it contained an inflammable substance; and, certainly, the experiments of the moderns have demonstrated, that this was a veritable conjecture of that illustrious and inimitable philosopher. The experiments of modern chemists have materially contributed to unfolding and ascertaining the properties and composition of water. The scientifical labours of the ingenious Lavoisier, were usefully applied to the subject, and exhibited an example and evidence of sagacity and persevering examination, from an imitation of which, some of the principal hodiernal discoveries claim their original and progress. Van Helmont ascertained, by experiment, that water was sufficient for the nourishment of vegetables; and hence a seemingly allowable conclusion, that water contained all the ingredients necessary for the perfection of their substance: but in this there must have been a fallacy.

From these experiments and their consequences, it was regularly deducible, that water cannot be an elementary or simple, but a compound substance. Boyle, in England, was the first who supposed that water contained an earthy substance. By digesting water in a glass vessel, in which it was isolated by hermetical enclosure, an earthy precipitate appeared. This, however, was owing to a circumstance, which in those days was inexplicable. Some of the silica of the glass must have been dissolved.

CXVII. Different attempts were made to ascertain its composition by different philosophers; although some of these procured a very small quantity of water by their processes, its composition was not completely and undeniably ascertained, until the experiments of Mr. Cavendish. A simultaneous approximation to the discovery of the composition of water, was observeable in the experiments of different individuals; but some drew from them inaccurate conclusions. At the same time nearly, Lavoisier, with some of his associates, by multiplied experiments also determined its composition. The consequence of all these experiments is, that water is a compound of hydrogene and oxygene. During the combustion of hydrogene, it rapidly combines with oxygene, and water is the resulting compound. The proportions of these ingredients, by weight, are about 85 to 86 of oxygene, and from 14 to 15 of hydrogene. The specific gravities of the two are remarkably different, and consequently the absolute volume of each, condensed and incorporated, is wonderfully disproportionate. These appellations of the component substances were imposed by the French chemists, and the one constituting the smallest proportion (by gravity,) of the composition, has more particularly got the denomination of the "water-maker." This is the hydrogene, which scarcely makes a seventh part of the whole, but arrogates this name from the supposition of its essentially supplying the specifical character of the compound. This is another example of the wonderful and unknown alteration caused by the combination of these two aeriform substances, each previously possessing distinctive and particular properties, &c.; but now, by their conjunction, completely obliterated. These, by the commixion, are completely abolished, and without the apparent evolution of any substance. The properties of the compound are wholly different from those of the uncombined constituents. These constituents are most probably kept in conjunction by chemical influence.

CXVIII. Although the foresaid aeroeidic substances are demonstrated, by the most authentic experiments, to be the components of this fluid, yet it is almost universally and perpetually in combination with a multiplicity of other heterogeneous substances. Water has the capability of absorbing air or combining with it, and always contains some of this article; and, contrarily, the atmosphere almost continually holds some water in the state of vapour. Within certain boundaries they are capable of receiving and containing one another. This is not surprising, when it is ascertained that they have a reciprocal attraction, (or by what name soever it may be called,) and have been in immediate and unceasing contiguity for some thousands of annual revolutions. The quantity of air actually and commonly contained in water, has, however, been variously estimated. The most accurate and probable declare it to be about $\frac{1}{28}$ by cubical measure, but this must be variable according to a multitude of circumstances. Boyle appears to be the first who determined the presence of air in water. The ingenious Scheele first remarked that the air contained in water occupies a more extensive proportion of oxygene than the air of the atmosphere. Water also generally contains about $\frac{1}{100}$ part, by measure, of liquid carbonate of oxygene, but the proportion by some is stated to be more considerable. Water obtained by melting snow and ice, without the presence of air, would supply it nearly or altogether free of these aerial liquids. The operation of boiling also disengages the most of the air which it may have contained: this operation suspended, it almost instantly absorbs its customary proportion. "The air held dissolved by water is expelled with great difficulty. If pressure be removed by the air-pump, part of it is disengaged; by strong boiling a considerable portion is expelled, and likewise by freezing: but a quantity is still retained, which is not expelled by any of these means." The removal of this quantity of air from water, is the cause of its vapidness; and from this circumstance arises the unpleasant insipidity, or mawkish quality, of water, which has lately undergone boiling or distillation. The presence of air, therefore, and more particularly of the carbonic acid, is necessary to give water its tasteful properties. The other substances which it may contain, either chemically combined, or simply by admixture, suspension and diffusion, according to the countless contingencies to which it is perpetually in exposition, are, in the present condition of human knowledge, incalculable.

cxix. The water proceeding from fountains in elevated situations, and where it has previously percolated through silicious channels, is generally to be preferred. And the water of those rivers, &c. which permeate channels containing pebbles, silicious bottoms, &c. are, other circumstances being favourable, the best qualified for supplying water susceptible of the subsequent purification and preservation. Agreeably to its supposititious impregnations, its temperature, &c. water, as lately hinted, has been differently distinguished: this imperfect classification has fulfilled no very beneficial purpose. Water differently impregnated may be got at the same place at various times, conformably to a multiplicity of fortuitously accompanying circumstances. The most remarkable qualifications of the water collected at particular times, must be attentively and discriminately investigated, and no confidence laid in overshadowing generalization.—In the procuration of this absolutely necessary article, three considerations seem to be particularly requisite; and these are its quality, quantity, and servation or keeping. These, then, are deserving of some attention and careful examination.

cxx. The goodness of water is of indispensable importance for the advantages of the seafaring; and the employment of it in a sufficient degree of pureness, cannot be too earnestly recommended, and regularly and faithfully submitted to performance. Without the suitable attention to this department, it is physically impossible to preserve their health so long uninjured as otherways might be practicable. To the superficial and inconsiderate, it may apparently be savouring of supererogation to institute and recommend such particular carefulness, and discreetness of management of this subject, which is ordinarily deemed to be inconsiderable. The beneficial consequences, however, of its intelligent observance, will adequately demonstrate the admissible, the indubitable, usefulness of its appropriation. It has, for some time, occasionally, called the attention of commanders and seafaring practitioners; but this business has not been carried beyond the possibility of farther improvement. Water is a fluid of such extensive, of such universal use, that it may very justly be estimated one of the most essential in a provisional assortment.

CXXI. The qualities of this article have always been considered as greatly influencing or affecting the person who might be liable, by its constant use, to the operation of these particular properties. The goodness of it has constantly been thought conducive to healthful disposition and longevity; and, oppositely, its badness or impurity, from what original soever deriveable, been considered inimical or injurious—the fruitful cause of numerous complaints and disordered affections. These have been continually subjects of observation, although commonly, or almost invariably, not sufficiently attended to for maritime purposes. Here it may be observed, that the general argument certainly operates as fully, or rather more forcibly, than in any other circumstances applicable to the preservation of healthiness. This element seldom or never occurs, naturally, in a proper degree of cleanness and transparency; and, especially, in many places where seamen may have occasion to gather this article for their own consumption. It becomes, therefore, often a consideration of importance, how it may be properly and thoroughly cleared from its more common and separable impurities. A variety of methods have been proposed, and contrivances suggested, for this purpose.—An observance of Nature's simple operations would originally contribute to the adoption of filtration. The observation, that water, however impure, by gradual transition over pebbly and sabulous surfaces, would acquire a certain degree of clearness and fairness, would thus serve as an illustration and a confirmation. And, moreover, that obtainable from deep wells or cavities, would, likeways, frequently undergo a purgation—the heavier, grosser, and insoluble matters, being gradually deposited.

CXXII. As the propriety and necessity of obtaining this article in a state of sufficient pureness, has already been strenuously inculcated, no argument can ever be allowable against its universal employment. When it cannot be naturally obtained of the sufficient clearness and cleanness, it should certainly be made so by artificial procedure. How extremely improper, it may be said, or, what is more, blameable, to employ water, perhaps surcharged, forsooth, with the abominable and detestable recrementitious evacuations and stillicidia of a populous city, &c.: this, however, is an impropriety too frequently remarkable. The sources from which it is obtained require the most careful attention, and this must extend to all the branches of communication, implying also all the circumstances of the neighbourhood. Disregard to these things has thrown a whole fleet into disease, distress, and not unfrequently mortiferous consequences. The more common sensible qualities of the water can often be determined without any laborious chemical examination. Any unusual or unnatural taste, colour, odour, are to any body instantly perceptible. Water is often rendered impure by the putrescent remains of vegetable and animal substances, and which is particularly prejudicial to those who may be under the necessity of using it in this state of contamination. And it is frequently employed when containing a proportion of the saline ingredients of sea water; and then, in common language, it is said to be brackish. This debasement may subsist in such a degree of dilution, as scarcely to be discovered by an ignorant or incurious observer. Contaminated with these materials, however, and continuedly used in this condition, it may be productive of different ailments, and especially disorders of the intestines. And it is, not improbably, favourable to the excitement of scorbutic disposition. Water may be contaminated or imbued with a variety of matters which cannot be discovered, or at least ascertained, without the assistance of chemical examination.

CXXIII. This liquid, when practicable, and no exculpation is allowable, should be procured from suitable fountains, or smartly running rivulets, which are not exposed to any particular defilement. Peculiar attention, indeed, should be always bestowed to obtain it without any dangerous pollution. A common practice, unluckily, prevails of gathering it at particular places, whether it possesses the requisite properties or those of an opposite description. Water should never be collected for keeping when corrupted with any improper ingredients: thus, brackish water, or when rendered impure by putrescent substances, is always improper. Water which has passed through lowlands, or woodlands, or swampy countries, or into which impurities of what description soever may have been evacuated or disembogued, is always objectionable, and not uncommonly prejudicial in its consequences. Water thus contaminated is certainly improper and oftentimes mischievous, unless previously subjected to sufficient purification. The different situations in foreign countries, islands, &c. are so tolerably understood, that it does not seem necessary to enumerate them with their respective peculiarities; and to particularize those in Britain, with their respective advantages and unfitness, must be superfluous. It would appear probable, that this needful element is, in some of these circumstances, more or less influenced and contaminated with carbonated hydrogene in some of its modifications, and perhaps, likeways, containing some phosphorus, or sulphur, &c. in combination.—The water itself, when nearly or altogether motionless, and impregnated with heterogeneous ingredients, undergoes a partial decomposition. This alteration of its constituent composition, ordinarily happens from part of its oxygene combining with some carbonous substance; and thus, part of its hydrogene is liberated or disengaged, and is ready to unite with other substances with which it may be disposed or qualified to form a conjunction. Some of these supervenient combinations are very prejudicial to the human constitution.

CXXIV. The water generally procured for different voyages, after the course of some weeks or months, and occasional exposure to augmented temperature, (but this, indeed, is not altogether required,) partly undergoes decomposition; or, more correctly and pertinently speaking, the extraneous substances which it holds are ordinarily the cause of this alteration: for pure water, unaffected with other substances, is comparatively unalterable. When the foresaid change happens, a quantity of carburetted and sulphuretted hydrogene is disengaged, or the hydrogene may be evolved, in conjunction with some other matters. This may be caused by a diminution of the oxygene of the water, in consequence of a part of it combining with carbone; and thus, a quantity of hydrogene is unoccupied, and associates with any other substance for which it has an affinity or elective attraction. This alludes especially to water which has been collected, and for some time retained in casks or barrels. The carburetted hydrogene is displayed by its inflammation upon the approach of an ignited body; a candle, for example. This frequently takes place in the Thames water, after having been confined for a few weeks: the peculiar odour emitted at the bung-hole proves the presence of this aeriform substance. Against this time, the water has commonly deposited a quantity of impurities; and if the containing vessel is allowed to remain unclosed, the carbonated hydrogene, &c. having exhaled, the water is more transparent.

CXXV. A matter deserving to be noticed, before leaving this subject, is the necessity of attending to the qualities of water collected from rivers, &c. in which the influence and refluence of the tide alternately operate. Brackish water, in these situations, is frequently gathered, and which, from blameable remissness, is perhaps only discoverable in its consequences. Ignorant man thus commonly stumbles through life, without even distinguishing the circumstances which to him may be advantageous or mischievous. His is the knowledge of fools, the consequence of disagreeable experience. Brackish water, too, it should be remarked, is generally obtained in all low tracts bordering on the sea; and in all these places, caution is adviseable in collecting water for marine purposes. This subject sometimes does not meet the needful attention, although one of the greatest moment. The people employed to gather water, are unqualified to examine and determine the qualities of this needful article; and so improprieties are continually inducing troublesome consequences. Commanders and officers, also, are generally concluded not to have that familiarized acquaintance with chemical operations, so as successfully to investigate its contamination or defilement. The surgeons assuming the medical guidance of ships' companies, should always have a competency of knowledge for determining its principal or predominating impregnations. In this place it cannot be expected that an elaborate disquisition upon all the accidental bodies which may be contained in water, as procureable from various sources, should be introduced. Water which is brackish, or, in other words, holding a small quantity of the salts, &c. usually contained in sea water, is detected by tasting; or, if the sense of taste in the examiner is not very curious, it may always be declared by chemical influence. The muriate of soda, or kitchen salt, is one of the articles which brackish water contains. This is decomposed by sulphuric acid, and the muriatic air is extracted, which instantly displays itself upon mingling with the common air; and by its odour, colour, &c. is instantly discoverable. Sulphate of soda is consequently formed, and remains in solution. The addition of nitrate of silver, if any muriatic acid is present, which in these instances implies its union with soda, &c. will immediately produce a milkiness, and afterwards a flocculent precipitate; and after some exposure, the fluid assumes a brownish coloration, and more especially if it is influenced by the presence of hydrogene. In this manner, the presence of an extremely small portion of this acid, &c. may be determined. Water observed to contain muriate of soda, and, therefore, in these situations the other salts—such as muriate of magnesia, muriate of lime, and sulphate of soda, which are commonly held in solution by sea water—should always be refused; it is commonly injurious.

CXXVI. Already it has been observed, that diverse methods have been invented for the cleansing or purifying of water. And whether it be obtained from the Thames—which is a common, but impure practice—the Hoogley, Ganges, the Chinese Tigris, &c. &c. or from whatever original it is deriveable, it should invariably be filtrated before embarcation, and most undoubtedly, in all cases, before distribution and application. The most effectual contrivances for its purification are filtration, boiling and distillation; and of these the last is the most effectual. The boiling and distilling of it are performed upon chemical principles, the filtration is commonly a mechanical operation, or even here these two may occasionally act in conjunction. Impurities may be detained and separated by mechanical assistance alone, or by combining chemically with some of the materials through which the straining is performable. Of all these modes, filtration is the most generally employed, and is a method commonly capable of answering the intended purpose. Boiled water, as is well known, is reckoned insipid, mawkish, and somewhat unpleasant. This originates, as lately said, from the extrication of air, the greater part of which is carbonate of oxygene. This air commonly gives the agreeable and moderately pungent sensation, which water occasionally communicates. Distilled water affords sensible qualities, nearly similar to those produced by boiling, but the former is in the state of greatest relative pureness.

CXXVII. Different substances have been used as intermedia for straining the water during filtration; pebbles, gravel, sand, charcoal, &c. either separately, or arranged in layers, according to the inclination and judgment of the manager or operator. Let it, however, be observed, that filtration, generally speaking, will separate those substances only which are suspended, but not chemically combined, with aqueous liquids. These matters, when combined by chemical action, cannot generally be expected to be separated, unless the materials used for the filtration were so provided as to decompose them, and incorporate with, or intercept them in their passage. This supposition and management would imply an antecedent knowledge of their existence, nature, and properties, and combinations, &c. which is frequently not obtainable, or perhaps not in possession, and oftentimes demanding penetrating scientifical examination. The water, in these filtering processes, has been made to assume different courses, continuing the operation of filtration. Descension in the perpendicular, which is the most common method; ascension upwards; or to proceed by a lateral inclination. A description of every promulgated contrivance, as many of them are not conveniently applicable on shipboard, would, in this place, be both needless and unavailing. All mechanicians, or persons of even moderate ingenuity, are capable of contriving and constructing apparatus sufficient for these purposes. The intention here must professedly be—to propose and commend the propriety, the necessity, and the general principles of these proceedings. For public purposes, it would require to be performed upon plans of considerable magnitude; sed salus populi (salus quantopère marinorum?) suprema lex. This appears to be a proposition irrefutable.

CXXVIII. The Gallican method, or Parisian well, might be employed, where water is to be filtered upon extensive principles. The intention would be answered by the formation of cavities, or hollows, of different capacities, agreeably to the intended operation; and afterwards, in these making two circular structures, of more extensive or contracted diameters, in proportion to circumstances. The space betwixt the innermost and outermost concentric buildings, may be occupied, to a suitable height, with small stones, pebbles, flinty sand, &c.; and then the remainder furnished with the water intended for filtration. This will gradually percolate through these different materials, and the interstices which may be allowed to continue at the bottom of the internal circular wall. The water which undergoes the operation of straining, will thus be naturally conveyed into the middlemost concavation; and from this it is easily removeable, by different expedients, as occasion may require. By thus constantly supplying the space betwixt the two circular walls, any quantity of water desireable, by proportioning the filtrating contrivance, will be obtainable. The quantity deriveable will be regulated by the construction and arrangement of the whole contrivance. A fabric of this description, and of no extraordinary magnitude, if under judicious management, might be sufficient for supplying all the navy of Great Britain. The materials employed, as intermedia of filtration, it is almost needless to remark, must be occasionally changed, or undergo the process of cleansing.

CXXIX. A machine proposed by Mr. Collins, would appear to answer these purposes usefully. The Patentee specifies the following commending properties of his invention. 1st. He obviates the difficulty resulting from the liquid intended to be depurated, passing through its own impurities, by enforcing it to assume a direction from the external to the internal parts of the machine, and then it is collected. 2nd. A second advantage is, mechanical pressure; by which it is quickly strained through the interstices of the filtrating materials. 3d. A third useful property, is the comparative smallness of the apparatus, and extent of the filtering surface, in contact with the liquid to be purified.—The common freestone or sandstone, hollowed, is an ordinary machine; but too confined in its operation to supply the desireable abundance on shipboard. In smaller vessels, however, with a moderate number of people, these may suffice for purifying the needful quantity; and, therefore, their assistance should never be neglected, as it is of the greatest moment to those persons who often are otherways very indifferently accommodated. The smallness of vessels should be no exclusive argument against the propriety of having their supplies of water always as pure and clear as possible. The smaller vessels employed in coasting voyages, for instance, have it in their power to obtain their water from springs or fountains, &c. of such clearness and goodness as generally not to require any artificial purification. Those chiefly concerned, however, in these things, are frequently too neglectful and inconsiderate to attend to the commendable management.

cxxx. Vessels made of sand and clay, as the alumina or pipe-clay, and sand, are sometimes employed. The water transmitted through these porous machines is, provided they have been properly fabricated, perfectly limpid. Filtrating machines, made of brittle materials, when carried to sea, would require to be protected with ligneous coverings. The general structure, also, may be of timber, and the substances used for filtration placed and arranged according to the particular conformation of the apparatus, and the quantities of water submitted to purification. The common method of two barrels, of different diameters: the smaller being placed within the larger—the former being suitably perforated in the bottom—and the materials for filtration being put betwixt the internal surface of the outer, and external of the inner barrel, the water to be filtered being supplied, will be received in the central vessel, after undergoing percolation. If the business is properly conducted, an unexpected quantity of clear water will thus be obtained. Machinery occupying no very large space, might be prepared for the successful filtration of water, competent for supplying the largest ship's company. Charcoal should always be considered as an excellent substance for constituting a part of the percolating intermedia. This article may be reduced to different degrees of fineness, agreeably to the particular intention, and the diversified gradations of the substrata, and the magnitude of the apparatus.

CXXXI. The materials used for filtration should be frequently replaced; when the preceding become burthened with impurities, they have a diminished advantage in purifying. The general design may be promoted and improved by a horizontal conduit, extending from the undermost part of the receptacle of the filtered liquid, with an aperture in the superior surface of its remotest extremity, by which the water will be projected into the air, and might then be received in a suitable reservoir. This mode of filtration will not be so applicable on shipboard, on account of the uncertain and irregular movements; but on shore this plan appears worthy of adoption. This method is employed by the Chinese, by which the foulest and most disgusting water is rendered colourless, and apparently inoffensive. Or if considered more convenient or beneficial, it may be allowed to descend from the bottom of the filtrating machine, and by dribbling through perforated plates, of materials not alterable by the water, (not having a mutual or chemical action upon each other,) interposed above the recipient, it will be considerably improved by the implication of air by absorption. A diversity of contrivances for the filtration of water might be mentioned, but in this disquisition it appears altogether unnecessary. Any person acquainted with the common principles of filtration, and possessed of only ordinary ingenuity, is capable of inventing machines or structures suitable to these purposes. The general methods already expressed, will be enough to explain the nature and intention of these processes, and that is deemed sufficient. The water, when properly depurated by filtration, unless it has previously been in chemical combination with some poisonous or improper substances, should now have the properties and evidences of good water, already enumerated.

CXXXII. As it may not always conveniently be practicable to filter the quantity of water requisite on shipboard, it seems commendable, that at all harbours of general resort for the navy (strictly so called,) and merchantmen, there should be, as already suggested, contrivances for filtration, so that the water may be sufficiently purified before embarcation. This commendation will be more particularly applicable in those places where the water does not naturally occur in the adviseable state of cleanness. In many low situations, the water can seldom be obtained in sufficient quantities, without being at same time contaminated with some heterogeneous impregnations. The common practice, in such situations, is to collect it from a common river, if such occurs in the neighbourhood. As thus obtained, the water is commonly much influenced in its properties by the combination of offensive impurities. The fountains, &c. if such there may be, are commonly unequal to the necessary supplies; so that the mode of procuration just mentioned becomes the alternative. The inconveniencies which have originated from this unfortunate impropriety, have been multifarious and considerable. These conclusions, relative to the injurious properties of water when contaminated, if applicable to the common practice in this country, is still more so when this important fluid is collected in different places in foreign countries. In many situations of these countries, the rivers traverse long tracts of lowlands, or pass through woods of amazing extent; they are, likeways, occasionally influenced by marshes and other places discharging mischievous inquinations.—A statement of facts must be considered sufficient; an explanation of occurrences is here inadmissible. In all situations, therefore, where the British do much business by shipping, there should be machines suitably contrived for the filtration of what water might be requisite; so that even a large fleet could obtain, without much delay, the necessary assistance.

CXXXIII. The boiling of water is sometimes serviceable, by disengaging substances which can be decomposed or evaporated in a temperature of 212°, and is thus capable of separating nearly all aerial bodies, which are not in a state of condensation with fixed alkaline materials. Boiling, therefore, may promote the cleansing of water in a twofold manner: 1st, by evaporating those substances which have volatility at the boiling standard of water; and, 2ndly, many articles may be decomposed; the aeriform being dissipated, and the weightier and insoluble ingredients will be deposited; and then decantation or filtration will separate the impurities. Boiling of the water, therefore, when charged with earthy matters, such as different salts of lime, with which water is most commonly influenced, will be occasionally found serviceable. After the operation of boiling, it would require to be exposed so as to imbibe a quantity of air; which intention may be accomplished by agitation, or passing it through a perforated machine, as already proposed. This precaution, if properly and completely executed, will remove its vapidity, which is a natural temporary consequence of this operation.

CXXXIV. The distillation of the water, although the most effectual process for its purification, is unluckily rather a slow proceeding; and on this account, &c. scarcely admissible for general employment: but when this fluid is impregnated with any dangerous or pernicious defedations, is, undoubtedly, the only method for fulfilling its desireable expurgation. After this operation, also, it has a mawkish taste, as was before stated, from the loss of its ordinary quantity of air, and will, as after boiling, require the addition of this to render the water grateful. So much, then, for the general principles of purifying this article, which is all that was intended on this branch of the subject. And may it, therefore, be an authentic and inviolable regulation, and perpetually and universally operative where *absolutely* practicable, and when considered to be necessary, that all water, collected and furnished for marine service, be sufficiently depurated. By a proportionate and faithful attention to this subject, which is almost inexcuseably too often overlooked, health, with all its inestimable advantages, would be wonderfully supported, and frequently beneficially prolonged. The prevention of many diseases would be extensively corroborated, and the profitable endeavours of sailors would thus additionally obtain encouragement and maintenance.

CXXXV. The quantity of water, according to the preceding subdivision of this subject, now claims some attention. The arguments previously brought forth, *mutatis mutandis*, in support of the advantages, or rather absolute necessity, of pure water, may also constitute suffrages for the propriety of an extensive allowance, and especially in tropical climates, or other places or seasons requiring this generous supply. In these regions, it should undoubtedly be dispensed in proportion to the naturally or accidentally occurring necessity of individuals. In the warmer climates and countries, the quantities of this essential article distributed are too often inadequate. The remarks already laid down upon the influence of augmented temperature, will assuredly indicate the suitableness of employing a proper quantity of liquids in those places where this inconvenience is unavoidable. The continual vaporation from the surface, consequently requires a countervailing substitution to be internally administered. If a proper allowance of water is not carefully and constantly furnished, the subsequent mischiefs, or even the concomitant distresses, will generally be prevailing in a corresponding proportion. A plentiful allowance of water is one of the most beneficial preservatives of healthiness; and this consideration, in fact, without any additional arguments, is surely enough to recommend its invariable employment. This, also, is more particularly adviseable, in conjunction with the dietetic materials commonly furnished for seafaring people. In several trading vessels, four or five pints of water are the quantity supplied for the daily use of one person: this portion may, perhaps, suffice in the colder climates, but is certainly not sufficient in the warmer or tropical.

CXXXVI. The most careful personal observation, and guarantied by the most circumspective consideration and comparison, would propose it to be an established regulation, and never to be disregarded nor forsaken, to give every individual a proportion calculated by his particular necessity. Inconsiderable or insignificant as this subject may seem to the thoughtless and injudicious, nevertheless, there is possibly no other concerning sailors so liable to prejudicial mismanagement. In the tropical and other intemperate latitudes, and when much exposure and laborious occupations are proceeding, then a copious quantity of water will be pointedly requisite. A quantity, varying from six pints to one gallon, should be always allowed for diurnal consumption. Permitting the people to employ it in quantities and separate divisions, according to their returning personal demands, is the method which should be generally preferred. The cravings of each person, which are different in the same on different occasions, and changeable in respective individuals, should be the regulating line of ministration. These circumstances alone, with the intelligent, constitute sufficient admonitions for the unrestrained continuance of this friendly supply. But even manifold other reflections appear favourable to its unintermitting employment. This laudable and useful contribution to the necessities of individuals, does not seem to command the procuration of any uncommon proportion of water for consumption. When liberally furnished it gives comfortable satisfaction, and very seldom in these circumstances is it uselessly expended, and by a little care this may always be prevented. The unpleasant curtailing the quantity of a man's drink, where Nature strongly urges a copious supply, may justly be considered as a grievous inconvenience, or rather an unmerciful punishment. No ordinary mischief could be so peculiarly troublesome and distressing. The urgent sensation called thirst is even aggravated, and becomes almost intolerable, from the idea of insufficiency of the fluid needed for its abatement. All these inconveniencies are expeditely remediable by the assistance of the common machine, the scuttle-butt, and hereby there is no unnecessary or superfluous expenditure.

cxxxvii. The concluding consideration on this subject, is the keeping of the water in vessels properly constructed and prepared for its preservation. Adequate attention is required to the nature of the barrels, &c. in which it is to be contained, or any other vessels intended for similar purposes, and in what figure soever they may be fabricated. They should be made of timber which has, as vulgarly expressed, been properly seasoned. A remark has also been made, that, when the internal surface has been converted into the state of charcoal, or carbonated, they are thus more usefully fitted or qualified for preserving this liquid. Barrels thus prepared, and the water disengaged from all pollution, is thus in the most probable state for lengthened preservation. The containing vessels should be wholly filled, and the bung-hole closed accurately.

cxxxviii. The particular shape of the vessel is not a subject demanding much attention. If all other circumstances are favourable, the containing vessel may assume all conceivable mathematical figurations, without any perceptible disadvantage. This conclusion remains unaffected, although it be confidently mentioned, that the method adopted by General Bentham, and tried on board the Arrow and Dart sloops of war, was apparently employed with advantage. Considering this proposition in a clear point of view, it is impossible to suppose that the particular shape of the containing vessels can have any effect in its preservation. The tanks, which were of a square figure, and adapted to the hold, were lined with plates of tinned copper; neither of which were proper materials to remain in contact with this liquid. The difference of quality of that reserved in the cisterns, and of that in the common barrels, must have depended upon unknown and incidental, but concurrently and dissimilarly operating circumstances.

CXXXIX. The internal surfaces of the casks may be charred; this indeed may be considered as proper and useful. If the water has been originally or artificially in a state of sufficient pureness for keeping, and securely barrelled, or put into other vessels, prepared in the way just mentioned, it may be kept in perfection even in the longest voyages. Water, it may be observed, *absolutely* free from all heterogeneous substances, is indestructible, never liable to decomposition or putrefaction. It is almost unnecessary to observe, that the vessels containing it should be previously in a state of complete cleanness. Even this, it is painful to say, is scarcely ever regarded. The carelessness of officers in this respect, is, generally speaking, lamentable and highly objectionable; at least, this is applicable to merchantmen. The unclean depositions of many former charges of water are allowed to continue in the casks, and which, in boisterous and unsettled weather, are again mingled with the water, and thus become a source of perpetual uncleanness, filthiness, and contamination. —Different substances have been proposed to be sprinkled or mixed with water, on purpose, as it is said, for assisting its purification. This proposal originates, it may seem, from a benevolent intention, but, on the other hand, has, in all probability, been very rarely serviceable; and, it is hoped, will be very seldom required, if the foregoing suggestions, and precautionary instructions, are duly considered and regulated in their application.

CXL. Charcoal is one of the matters which may be sprinkled into the water, and by occasional agitation will be generally diffused, and thereby produce any useful effects naturally to be expected from the application of this substance. This substance in aqueous liquids is altogether insoluble, and may, therefore, combine with any matters for which it has an attraction, and will be afterwards completely but leisurely deposited. Various other articles have been mingled with water for the purpose of depuration or preservation; lime, carbonate of lime, supersulphate of alumina and lixive, supertartrate of potash, &c. have been recommended. These different materials, with many others which might be specified, must, it appears, operate upon chemical principles. The precise nature of the operation, but certainly its amount, will depend upon the extraneous substances with which the water may be impregnated. The immediate alterations thus produced are frequently difficultly understood, and the enodation of the difficulty would presuppose a knowledge of every ingredient which the water may contain in dissolution or commixture. These circumstances are sometimes determinable by keen chemical experiments. A scrutinizing minuteness of investigation often surpassing the ordinary practitioner's capability. Thus, by the compilers on the diseases of seamen, a farrago of substances have been variously proposed, and sometimes used for the foresaid purposes. As there is no particular necessity for employing them, so their enumeration, and description of their particular application, would be deemed superfluous. The marine practitioner, however, should be thoroughly equipped by his general philosophical knowledge, to determine whether water be fit for use, or if it is rendered unfit by improper and hurtful properties, communicated by unwholesome impregnations.

CXLI. Propriety, advantage, necessity, humanity, all—both disjointly and aggregately—recommend these considerations to faithful observance and performance. Every circumstance or thing which may be serviceable in meliorating the condition of that part of mankind, who have to live in a very unnatural and unpleasant situation, constantly exposed to hardships, difficulties, frequent privations and dangers, should be perpetually subjects of commiserating consideration. Inattention to these subjects (which may justly be considered as of fundamental and indispensable importance, both for the comfort and health of mankind, in what situation soever they may be placed; but they appear to be of especial moment to seafaring persons, and those who may be confined in garrisons, &c.) has too frequently been productive of disagreeable inconvenience and mischievous consequences. The subject, further, seems entitled to suitable or becoming attention, from the consideration, that, very commonly, it has been either overlooked or disregarded. From this unkind neglect, the health of seamen has often suffered both in the navy and merchantmen. The three heads under which this interesting subject is herein considered, seem to comprehend every thing necessary to be suggested and explained. It is a subject, indeed, in which the welfare of the whole human race is concerned; for even the wildest savage knows the advantages and gratification which good water affords, and the unpleasant and injurious nature of water which is impregnated with heterogeneous and prejudicial substances. The benefit of good water is strongly declared and realized among those tribes and nations, who generally employ it as their common beverage. Among the corrupted part of mankind, and who are addicted to the use of ardent and vinous liquors, the qualities of water are not of such inestimable consequence. It is even not of such remarkable importance in rural life, or even in ordinary life, generally speaking, where the water is commonly boiled, or modified by some culinary process or operation, previously to its assumption or employment. But in a sea life, and especially in the warmer climates, a great proportion of this invaluable liquid is used without the assistance of any qualifying preparation.

CXLII. A diversity of other liquids, of which water, however, is a principal part, are commonly employed. As these, from the frequency and generality of their use, are, strictly speaking, deserving of attention, some occasional remarks upon a few of them may not be deemed improper. In the estimation of sailors, ardent spirits occupy a notable station; they are considered as their most beloved and sovereign beverage. These precious, these darling liquors, withheld or abstracted, they become discontented, and conceive that some comforting and animating support has been rescinded or withdrawn. It is now altogether impossible to ascertain the time of the invention, or to recover the history, of the original formation and adoption of spirituous liquors; but, it is extremely probable, that they were primarily prepared without any complicated management. They probably were, on their first preparation, little more than infusions of some of the common farinaceous grains, which are now known to afford alcohol by undergoing particular processes, or these infusions changed and heightened in their properties by fermentation. The observance of the simplicity of barbarous and imperfectly reclaimed nations, seems to evince, that all primitive and original contrivances generally possess this property of simplicity in an eminent degree. The preparation of their victuals and common drinks all tend to authorize the foregoing conclusion. The original formation of all these articles, in this manner becomes conveniently explicable. The grape, as formerly observed, is naturally the produce of the warmer climates, and the temperate latitudes appear more particularly conducive to its perfection. The wine first mentioned in history, was, probably, the expressed juice of the grape without much additional or subsequent alteration; hence, perhaps, it is emphatically styled "the pure blood of the grape." Grapes, therefore, being naturally produced in the moderate or temperate climates, which were the first inhabited by mankind, their juice, when expressed and allowed to remain for some time undisturbed—as possessing in itself the ingredients suitable and necessary to the formation of vinous liquors—would speedily, *omnibus faventibus*, undergo the fermenting operation needful for its accomplishment. The natives would soon observe and experience the more powerful and inebriating properties produced by this particular but unknown alteration.

CXLIII. Different varieties of the feebler or weaker fermented liquors, are, likeways, sometimes supplied for the use of seamen; but this practice is more common in the navy than in the vessels employed in mercantile undertakings. These, if carefully and honestly prepared, and from materials of genuine and suitable properties, are very convenient beverages, and should, when possible, be allowed in moderate proportion. An amendment of considerable importance it might be estimated, if the pernicious spirituous liquors generally furnished to seamen were commuted for good beer, as their common allowance. The invention of beer is ascribed to the Ægyptians, but for this assertion there is not the smallest shadow of certainty. This has been prepared from a variety of grains, and by different nations, from time immemorial. In Europe it is commonly made from barley, but, since the increased price of materials and labour, or rather the increased artifice and practical roguery of mankind, it is too often, notwithstanding the prohibition of salutary statutes, fraudulently prepared, and most wickedly adulterated. Beer, if obtained of genuine quality, and more generally given to sailors, would be conferring upon them a kindness and advantage which they are unqualified and unwilling to appreciate. Unfortunately, however, their usual and beloved liquid, the ardent spirits, are too strongly relished by these people; so that it might be considered an Herculean exploit entirely to withdraw their customary ministration. The quantities sometimes exhibited, it seems, might be considerably shortened, or perhaps their use might gradually and cautiously be suspended.

CXLIV. Wine, although of inferior quality, in the Royal Navy is ordinarily supplied, but seldom or never in merchantmen. A salutary change of this nature would be recognized with gratitude by every well-wisher to humanity. A reduction of the ordinary allowance of ardent spirits, and the adoption of beer of proper strength and goodness, might be preventive of numerous and hurtful mischiefs; but the mention of which here does not appear necessary. The consequences are completely understood, or, at all events, sufficiently conspicuous to mournful observation and experience. It would also in this place be improper, and not altogether beneficial, to undertake a lengthened examination, or disquisition, concerning the arguments so commonly employed, either in commendation or dispraise of distilled spirits. Venality, and the expectation or enjoyment of advantage, have prompted some to be the advocates of their abundant ingurgitation; while degenerated appetites, a vehement lust for the besotting and poisonous draught, and guzzling habitudes, strengthen and regulate the practices of others who are unhappily sensualized. This infatuation, like a projectile substance, moves down an inclined surface, where the progressive swiftness is continually accelerated by augmenting momentum and gravitation. Another party of men, however, friendly supporters of moderation and sobriety, considerate and intelligent observers of the deleterious consequences resulting from their excessive and continual assumption, have commendably and beneficially disapproved even their temperate, far more their immoderate employment. Every practitioner's experience, the manifold disgusting and calamitous examples occurring in public hospitals and elsewhere, adequately demonstrate, that the baneful effects of the irregular and undue use of ardent spirits confessedly surpass any ordinary conception.

CXLV. These liquids are of more late invention than either wine or beer. They are supposed to have been first obtained by the Arabian alchymists. As has been the fate of manifold other inventions or discoveries, which have not been regularly transmitted by the aidance of authentic historical recordations, their original lies hid in inscrutable darkness. They were probably first obtained in the northern regions; for the most ancient historians mention the employment of inebriating liquors first in those countries. Chemical research must have made some progress before ardent spirits could be properly prepared. Vinous liquors were known to the Hebrews; but, as before hinted, most probably not thoroughly perfected by suitable fermentation, and subsequent management. When genuine and well made, wine would appear to be a more salutary liquid for general use than ardent spirits. A remark has also been made, that the general health of those people, in ships where wine has been allowed and generally dispensed, exceeded that of those to whom spirits were usually supplied. Some who appear capacitated to institute faithful and discerning observation, have, in the course of their experience, concluded, that in particular circumstances, the continual exhibition of ardent spirits has been favourable to the production and aggravation of scorbutic disposition. A protracted and watchfully attentive personal observation, however, has not satisfactorily established the genuineness of this conclusion; but this is not communicated as absolutely affirmative.

CXLVI. Beer, it was lately said, of an inferior strength, is commonly supplied to the people occupied in the Royal Navy, and especially when stationed near their native country, or for some time after leaving it for remoter destinations. By particular management, it may here be remarked, it is possible to supply it, of various degrees of strength, in any climate or latitude in which it may be required. Beer of a proper strength, and originally skilfully and honestly prepared, is capable of keeping in any climate whatever, in which the British may have inclination to establish or sojourn. And if considered adviseable, which will be the case, it could be reduced to any desireable strength before its exhibition. This circumstance has not been properly regarded, but is deserving of being referred to the determination of experiment. Small beer, as it is called, is thus expeditely preparable at any place or season, and will be a comfortable and refreshing beverage in the warmer climates. Different advantages will be deriveable from carrying the beer to sea of a proper strength. The article may be stowed in smaller compass; its properties continue longer unimpaired; it may be so diluted as to be suitable to different conditions of systematic strength, and the variegated circumstances of distempers; and is, therefore, (from its capability of preservation,) an article always in possession, and will be frequently beneficial both to the healthful and complaining. Certainly it would be extremely proper, always to provide a quantity of genuine ale for tropical climates; and if not supplied to the people in diurnal allowance, a certain measure might be occasionally permitted. This liquor, when good, may also be considered as a medicinal substance, possessing considerable usefulness to scorbutics, and those recovering from different diseases. As translatitious confirmation, that mischievous consequences frequently arise from the undue use of ardent spirits, the subsequent notifications from Robertson and Trotter, gentlemen much experienced in the circumstances and misfortunes of the seafaring, may be introduced. The first of these mentions, "That grog, drunk to excess, will sometimes produce scurvy; let the patient's circumstances and situation, in other respects, be ever so advantageous and comfortable. I have seen several instances of this amongst gentlemen. Grog occasions scurvy, by destroying the digestive powers, or tone of the stomach and intestines; and all manner of appetite for food. (It also, probably, occasions obstructions of the mesenteric glands and liver.) I, therefore, class grog as one of the principal causes of scurvy amongst seamen of the navy. Where either good beer or good wine is served, scurvy more seldom, I may say very seldom, appears or becomes fatal. While, after men have been at sea long, under the circumstances I have mentioned, one fit of intemperance will be sufficient to induce scurvy. But the baneful effect of intemperance amongst a ship's company, not only induces scurvy, but is more evident in many other respects. For scarcely one fit of intoxication happens to the seaman that does not occasion some accident, accompanied with contusion, strain, fracture, or wound; which give rise to inflammation and ulcer, and those again often to fatal diseases. It is melancholy to reflect, that so many healthy men should become invalids, or lose their lives, merely from drunkenness. Few, very few, are wounded or hurt on real service, and rendered invalids in the navy, compared to the number that are disabled, and even lose their lives, by the vice of drunkenness. Casuists may refine and expatiate on the subject of cruelty, or of punishing seamen for that horrid vice, as they please; but I am fully satisfied, that it would be perfect humanity and benevolence, *never*, when a ship is first put into commission, to pardon a seaman for getting drunk. On the contrary, let every one be punished with particular severity, in some way or other, to deter them and others from committing this destructive and detestable vice, which would prevent them from accidents, and their dangerous consequences, hurts and wounds; which they continually receive, either by falling or fighting, and which most certainly follow slowly, if not immediately."

CXLVII. The following is a transcript of a letter from Admiral Waldegrave, addressed to Dr. Trotter, then physician to the fleet, upon this important subject. "After reading," says Waldegrave, "your treatise on naval hospitals, I can have little doubt of your making use of your utmost exertions, to promote any measure that can contribute to the health and comfort of our seamen. It is from this consideration, that I now lay before you copies of papers, the originals of which I have just transmitted to the Lords Commissioners of Admiralty; not doubting, if seconded by your efforts on this occasion, but that my statement will produce the desired effect. Whilst on this subject, I think it my duty to add, that a few days after we began to serve *grog* to the people, the scurvy made a most rapid progress; and as this is by no means the first time that I have had occasion to make the same observation, I am thoroughly convinced, that, could it be made convenient to government to serve out a wholesome genuine wine, (and such, I apprehend, might be found without much difficulty, or any considerable expense,) in *lieu* of spirits, that many lives might be saved, and the naval hospitals less crowded with scorbutic patients; two-thirds of whom are lost to the service, either by desertion, or the accumulation of fresh diseases. June 6th, 1795."—The following is Trotter's answer to the Admiral: "I am this day honoured with your obliging letter, inclosing remarks by the surgeons of your squadron, on the effects of lemons in the treatment of scurvy. What I have particularly observed in these communications, is an increase of the scorbutics, during the use of *grog*. This has been long known, but never before so clearly ascertained." In his observations on the scurvy, he makes the following remarks: "With respect to diluted spirits, or grog, instead of wine or beer, it is certainly an unsalutary substitute. The use of it ought to be checked by every prudent precaution. Whatever exhilarating effects, and pleasing sensations, it may excite, it is of all stimulants, perhaps, the most dangerous to indulge in. Beer and wine, as abounding with sugar and mucilage, are nourishing and healthful; but diluted spirits have a very contrary tendency. Grog exhausts and debilitates the constitution; as communicating a more sudden stimulus to the stomach, it is, of all liquors, the most likely to induce a habit of dram-drinking, with all its horrid consequences. A quantity of sugar ought, therefore, to be always mixed with the spirits and water; orange, lime, or lemon juice, where they can be procured, which make an artificial wine, may be added, as rendering the composition still more salutary and anti-scorbutic." The combined evidence here produced, is given from the observations and experience of two gentlemen, who enjoyed very extensive and prolonged opportunities for instituting and establishing their respective conclusions.

CXLVIII. As the commendation of beer, as a substitute to ardent spirits, is not unprecedented, the following suggestions upon the subject are not improper, and more especially as they are authentic, and additionally corroborative of the Author's animadversions. The subsequent observations on beer, &c. are taken from Cochrane, already mentioned, as quoted in Medicina Nautica. "Beer.—To every quart of porter or strong ale, add two quarts of water, moderately warm. To every quart of this mixture, add a table-spoonful of brown sugar, or a wine-glass-full of syrup or molasses. Put the whole into a tub; beat and whisk it with a bundle of rods, for at least half an hour; bottle and cork it, and tie the corks down with strings. The pressure of the corks upon the strings will show the progress of fermentation, which will be slow or quick in proportion to the warmth of the weather. In the East or West Indies, fermentation is so quick, that what is made in the evening is ripe next day. When once made, always preserve a bottle or two of the old, and mix it with the new making, as it quickens the fermentation, and makes it more brisk and lively. The quantity made must be, in warm climates, in proportion to the daily consumption, as it speedily turns sour. If this small beer is wanted in large quantities, it may be made in casks, in the same manner as spruce beer: but do not draw it entirely off; always reserve a proportion of the old to mix with the new. The ale to be taken to sea for the purpose of making this beverage, ought to be made very strong; but by no means to be reduced to an extract, or such a substance by boiling, as will evaporate the vinous and active part of the malt liquor. Good strong ale, that will bear thrice its quantity of water, will be sufficient." Dr. Trotter hereupon makes the following remarks: " We have thus, by the plan of the honourable author, a small beer that can be made in any climate, and its value to the sick in warm countries is beyond rubies. Officers, whose fortunes enable them to bestow comforts on the sick, would do well to provide some dozens of strong-bodied ale for that purpose, which can be manufactured under the eye of the surgeon when there is occasion for it. Mr. Cochrane also recommends the grog to be made into punch with brown sugar, which, when bottled and kept a little while, undergoes a slight fermentation, and becomes brisk and wonderfully grateful. Our surgeons, being now well provided with lemon-juice and sugar, can prepare *punch* in this manner without any expense; as the purser would charge the spirit to the sick that use it." And a little after, Trotter introduces the following observations relative to this subject: "We have always been advocates for some change here; but we have been disappointed hitherto. We have, however, overcome so many bad forms, that we must persevere still. Our plan is, that two quarts of beer should be served out at twice, that shall contain the same proportion of malt as four of the present, but more hops, to make it keep. Besides the baneful effects of grog to health, the seamen have a practice of hoarding it up, that they may have a jolly drinking, as they term it; and, I am sorry to add, this has given birth to much of their outrageous proceedings: for the unguarded character has thus been decoyed, and made an associate in plots by the designing and unprincipled villain. This kind of beer is only intended for sea use."

CXLIX. As this subject is of the utmost moment, not only with reference to considerations comprehending the preservation of constitutional healthiness, but likeways with relation to morality, some additional transcriptions—both as explicative and confirmative of some of the Author's disquisitions—may not be deemed unnecessary. Dr. Robertson, in his Observations, &c. on the Diseases of Seamen, when descanting on the prejudicial consequences of intemperance, observes as follows: "As consequences of hurts" (subsecutive to inebriation,) "may be reckoned, phthisis pulmonalis, or consumption; scurvy, and ruptures. Again, as a consequence of the latter, fever (symptomatic fever is here understood,) with its train of evils often follows. (Inflammation; strangulation; suppuration, or gangrene.) Setting the advantages which would redound to the public service from the sobriety of the people entirely aside—and it is obvious these would be many—it is likewise deserving of serious consideration and regret, that, in the state of stupor and drunkenness, they are guilty of the infernal practice of applying oil of vitriol to their sore shins, *as they call them*, to render their ulcers incurable for the present; that they may get invalided. Which was often perpetrated in the American war, and oftener than once by some individual wretches.—I have been told, their manner of accomplishing this intention was, as soon as they were discharged, to make it their business to get their ulcers healed, or reduced within as narrow a compass and as soon as possible; that they might enter again on board of ships for the large bounties which were given to seamen; who, owing to their scarcity, were not rejected for a slight sore shin. They no sooner, however, were entered on board, and received all the enormous bounties, than it became their study to reduce their ulcers to their former foul and alarming state, by having recourse to the same disgraceful means they had practised, that they might be sent to the hospital, and again commit the same base fraud which they had done before. In consequence of which it became necessary, in various cases, to amputate the leg, and it may be said, perhaps *deservedly*." After mentioning some more of the disagreeable consequences of drunkenness, which are too well known to the experienced marine practitioner to need specification, the author last expressed goes on to communicate: "So far I have only considered the pernicious effects of drunkenness in a political view. But if considered in a moral view, how much more detestable and criminal is the vice? Very few vices will be found to exceed it in magnitude.—During the fit of intoxication, the individual is perfectly unmanned, and is rendered incapable of performing his duty towards God, towards his king, towards society, and even towards himself. In the latter sense he is not able to put in force the very first law of nature, self-defence, be his situation ever so precarious. Nor is he able to flee from the danger of instant death, whether threatened by fire or shipwreck. Being past the power of resistance, he may be wholly at the mercy of an insolent foe.

CL. " How galling to the thinking generous mind must it be, even to suppose in reflection, that during the short beastly indulgence he has had; by being off his guard and duty he has left a post unguarded by which a public or private enemy has entered and robbed him of his honour, and insulted that of his country, which ought to be dearer than life itself to him.—When returned to reason, and he looks back on the precipice he has perhaps narrowly escaped; when he reflects how grossly he may have offended the Almighty by the neglect of his duty towards Him who has been the preserver of his life amidst dangers and death; by taking His name in vain; and by ill treating his fellow-creatures, his family, all that is most dear to him; and by even destroying his own health—What must be his sensations?"—The following is an abstract from a letter of Dr. Trotter, addressed to Mr. Nepean, then Secretary of the Admiralty. " Although the subject of this letter may in some respects be deemed foreign to the department of medicine; yet, as connected with it in others, in the general plan of preserving health in the fleet; I shall hope to be forgiven as an executive medical officer, in requesting the attention of their Lordships to what may be conceived of more importance to naval service, than any thing which I have had the honour, for a length of time, to submit to their deliberation.—Since the ships of the fleet have chiefly refitted at the Western ports; and the pay as well as the prize-money of the whole have been paid at Plymouth, an unusual influx of money has of course taken place in these towns; but especially at Plymouth Dock. Where so large a number of seamen, from the increased number of ships in the fleet, have occasion to spend their wages, those tumults and excesses, the common offspring of their irregularities, when unrestrained by discipline, have multiplied in proportion. Sudden death, in many instances, has been the consequence; health has suffered in the whole; and every vicious propensity has been encouraged. The inhabitants of this place, in order to avail themselves fully of the rich harvest which the profusion of the seamen is daily holding forth, have, by interest and address with the neighbouring magistrates, opened within these eight months [The letter is dated "August 18, 1800."] not less than one hundred and forty *additional* public houses in the town of Dock only! Each of these taverns may be considered as the haunts (haunt) of so many *dæmons*, that are dooming the destruction of our people; as so many *volcanos* (volcanoes) that are pouring forth the blasts of death and disease! A certain number of houses have, (has,) by the strong grasp of avarice, been pitched upon for the purpose of gin-shops; and if the present inhabitant did not chuse to take out the licence for vending liquors, he was turned out of doors, and his house made over to somebody else. If such is the prevailing practice, their Lordships must be aware into what dangerous society the heedless and improvident seamen may be decoyed. In resorts of this description the general mutiny of 1797 was first planned: there the Irish catholic priests took up their abode, when they swore in the United Irishmen of the fleet to extirpate every protestant in our ships; and there also the crimps are concealed, that delude and persuade our seamen to desertion. Such is the degraded state of police of this town, containing upwards of 25,000 inhabitants!" Although this account is partial, (or applied only to one place,) yet it is, in some measure, applicable to most of the maritime towns which are exposed to the visitations of the seafaring. These quotations, with the illustrations and confirmations which they comprise, will constitute evidence complete of the important nature of the management of this part of discipline, and of its singular influence in dietetical arrangements and administration.

CLI. The Spruce Beer, as it is called, is another useful article, and should be more generally employed, and especially in the warmer climates. A beverage, too, which is very readily prepared in those situations in which fermentation commences so speedily, and proceeds with such rapidness. This beer is commonly prepared with molasses, &c. but if good muscovado, or raw or powdered sugar, were substituted, the qualities of the liquor would be improved. Another method of forming the spruce beer may be mentioned, as it is the speediest and most effectual for obtaining this article of sufficiently good qualities. A quantity of strong pale beer may be diluted with water; the proportion of this latter varying, according to the intention: but from $\frac{6}{10}$ to $\frac{8}{10}$ will generally answer the purpose. A moderate quantity of sugar may now be added, and, with the condensed extract of the spruce fir, the composition may be put in a cask or barrel, and gently closed. By occasional agitation in the favourable temperature of a tropical climate, the fermentation will almost immediately commence, and run on with great quickness; and thus an agreeable beverage will be conveniently and expeditiously obtainable. Sometimes, for particular purposes, the thickened extract of the juice of the spruce may not be combined, but the adjunction of some ginger, or other aromatic article, be substituted. This brewing, if properly prepared, will be a pleasant and moderately poignant drink to the scorbutic, the enfeebled, and the convalescent. These liquors, which are so cheaply procureable, should be always allowed to people in the forementioned circumstances. A liberal allowance of it should be permitted to those threatened with scorbutic affection, and would, if generally distributed, be of remarkable advantage. The benefits which it may furnish, probably arise from the carbonated oxygene it contains; and when freely dispensed, will operate as a moderate laxative, which will frequently be particularly serviceable. The materials from which the spruce or ginger beer are made, should be of approved qualities. The essence of the spruce (as it is commonly denominated,) should have been properly prepared by moderated vaporation, and afterwards have nothing of the empyreuma, (ambustio, ut ciborum in olla,) or, in English, the scorched or singed odour. The spissation of the juice should be cautiously accomplished, and in a moderate temperature. The Cider, or apple-juice fermented, the Perry also, or pear-juice submitted to a similar operation, will be exceedingly grateful to the afflicted, and should be occasionally given for these purposes.

CLII. The cider and perry will form agreeable beverages to the sick or indisposed, and may be extremely useful to scorbutics, or those threatened with this complaint. In seasons which are plentiful in fruitage, these liquors may be purchased at a cheap rate, in the English counties in which apples and pears are cultivated, purposely to their production; and should, therefore, be generally furnished for the occasional assistance of ships' companies. It is mentioned, "That there is a practice now in use, on board of the American whalers, who are generally out ten or twelve months in a voyage, that deserves to be mentioned. They take cyder on board in casks, into which they put a quantity of sound apples. The apples are thus kept in high preservation; and as they draw off the cyder, the apples are given to the men, to be either eat raw, or made into puddings." This is certainly the most probable method of keeping the apples; they are thus immersed in their own juice, (or at least the juice of the same kind of fruit,) which has been modified by the previously intervening act of fermentation. The apples have been repeatedly used in the British Navy, when lime-juice was not to be obtained; but, upon these occasions, they were got directly from the country in which they were natively produced. How far dependence can be placed on Dumont's plan of attempting to preserve them in carbonic acid air, remains to be determined. But this is of less importance, as they are susceptible of preservation in cider, or their own juice previously fermented. By this method, also, two purposes are answered; both the fruit in substance, and the acidulous beverage prepared therefrom, are susceptible of stowage in nearly the same space which either of them would occupy separately.

CLIII. A promise was made, of suggesting a few observations upon some articles which are not so much employed expressly for ordinary dietetical purposes, and some of which furnish very little or no nourishment, as in the shape of condiments. Of these seasoning substances, Vinegar, Oil, &c. may be mentioned, and should, as being serviceable, always be supplied. The vinegar, in the common condition, as procured from the merchant or preparer, is generally in a state of impurity, and seldom fit for long keeping. In this there appears some impropriety; as the distilled vinegar would be both more pleasant, and susceptible of keeping as long as necessary. The strength of it, likeways, is modifiable by the addition of what water may be deemed adviseable. Distilled vinegar may be reduced, by the assistance of water, from ½ to ¼ of its former strength. This dilution can be effected shortly before it is applied to use, and thus knowing the strength of the acetous acid, the subsequent reduction can be accordingly regulated. The oil should be fine and good, not become rancid, and, if mingled with the vinegar and mustard, will form an useful condiment with the salted animal matters which make so large a part in the sailor's bill of dietetical allowances.

CLIV. One article more may be mentioned, and this is the Portable Soup, as it is called; the gelatine of animal matters. This is obtained from the Decoction of these substances, but chiefly from that of muscular and tendinous structure, by thickening or inspissating it, or by refrigeration and consequent spontaneous coagulation or congelation. In the navy, some of this is generally attached to the surgeon's remedial collection. When carelessly prepared, or procured from the coarser animal materials, it is unpleasant to the sick; and may be considered, when boiled, not more agreeable than common glue in a state of dissolution. The quality of the article, therefore, requires attention. If the method of preparing animal substances, proposed and practised by M. Appert, shall be found completely successful, and the consequences beneficial, it should certainly be preferred to the stuff usually styled portable soup. The natural history of this latter is perhaps entirely unknown to the consumer; and some persons of delicate or ticklish feelings cannot readily separate from their minds the conception of something disgusting, in an article which *may be* prepared from improper substances. The boiled meat of M. Appert presents more of the natural appearance, or, at least, sensible qualities of meat, as commonly prepared in domestic cookery. The portable soup, however, if *carefully* and *honestly* prepared, will be found both acceptable and serviceable to the debilitated and convalescent; and, if the other preparation is not supplied, this should undoubtedly constitute a part of the practitioner's auxiliaries. But meat prepared in Appert's manner, from the possibility of its lengthened preservation, should be furnished not only in quantities sufficient for the indisposed, but should be occasionally distributed as a preventative.

CLV. As the sea life is obnoxious to manifold difficulties and dangers, and, occasionally, also to painful privations, while commenting shortly upon dietetical supplies calculated for the seafaring, it may not be improper to introduce the following suggestions, deduced from Lind's experimental investigation. "The substances I have found most fit for the purpose, are powder of salep and portable soup; which convey the greatest quantity of vegetable and animal nourishment under the smallest bulk. An ounce of powdered salep and another of portable soup, dissolved in two quarts of boiling water, become a rich thick jelly, capable of receiving any flavour from the addition of spices. This is sufficient sustenance for one man a day; two pounds of each would serve him a month; and being a mixture of both animal and vegetable food, it is more wholesome than either used alone.—There are daily instances of persons being supported for many months by a much less nourishing diet, boiled rice, and even by gum arabic alone. Hasselquist, in his voyage to the Levant, informs us, that a caravan from Ethiopia to Egypt, having expended all their provisions, lived for two months on gum arabic dissolved in water; this gum having been luckily part of their merchandize. The gum senega, or arabic, serves as sustenance for whole negro towns, during a scarcity of other provisions occasioned by a failure of their crops of millet and rice; and the Arabs, who twice a year collect this gum in the inland forests on the north side of the river Niger, have no other provisions to live upon for some months.

CLVI. "The jelly of salep and portable soup are (is) far more wholesome and nourishing than double the quantity, or a gallon, of rice-cake made by boiling rice in water, on which sailors are often obliged solely to subsist for several months, especially in voyages to Guinea, after the bread and flour are exhausted, and the beef and pork have become unfit for use.—The expence of the two articles recommended is trifling. The powder of salep is generally sold for four shillings and sixpence a pound; and a pound of portable soup, which conveys, if properly made, the nourishment of twelve pounds of beef, is sold for half-a-crown. The superiority of salep to other vegetable substances, is confined to its conveying more nourishment; it can also be on emergencies used as food without boiling; on this account, it may often be used in situations where other substances cannot be dressed.—The addition of spices to the portable soup and salep, will not only render them more grateful to the palate, but also tend to improve their nutritive qualities; as would appear from the following late incident of famine on board a ship at sea.—In the year 1762, while the English troops were at Manilla, a Malaye ship arrived there from Macassar, which, by the shifting of the monsoon, had been detained at sea much longer than was expected; the men had been reduced to such extremities for want of provisions, as to be obliged to subsist for two months almost wholly upon water and spices; the latter, viz. cinnamon, mace, and pepper, being the cargo of the ship; notwithstanding which, upon their arrival at Manilla, they all, to the number of thirty, were in perfect health.—Salep and portable soup, when kept dry, will remain good for many years.

CLVII. "As two pounds of salep, with an equal quantity of portable soup, will afford a wholesome diet to one person for a month, would it not be expedient for every ship to carry to sea a quantity of these articles, in proportion to the number of the men, lest, from unavoidable accidents, the other provisions might be exhausted during the voyage, or through fire, shipwreck, or other accidents, the crew be obliged to have recourse to their boats? Supposing a boat furnished with eleven gallons of water, two pounds of salep, and two pounds of portable beef-soup for each person, none in it will die of hunger or thirst for at least a month: during which time, the daily allowance of each person will be more than a quart of water, eleven ounces of a strong salep paste, and an ounce of portable soup. The soup should be allowed to melt in the mouth; and in that small quantity, if properly made, are contained the nourishing juices of above three quarters of a pound of beef. In cases of great extremity, the salep may be mixed with the sea water, and will still be equally wholesome." Dr. Lind adds in a note, "One necessary precaution, which ought never to be omitted in a ship at sea, is, always to have a cask of water either in the boat, or in some convenient place upon the deck, from which it may be easily conveyed into the boat; as, in cases of fire and many other disasters at sea, when the crew betake themselves to the boats, it is often impossible to go down into the hold for water. The same precaution is equally necessary with respect to the salep and portable soup."—Lind then mentions a circumstance of some importance to the seafaring, and especially to common sailors, who may be more rigidly under authority. "I may add, as a scarcity of provisions at sea may sometimes proceed from the avarice of the masters of merchant ships, who, from a lucrative view, have taken on board too small a quantity of provisions;" (and he might have added, do the skippers of such vessels never dispose of provisions in foreign places, and thus lessen the suitable allowances of their ships' companies?) "if the masters were obliged by the articles of agreement with the men, to pay a stipulated allowance of money for any deficiency that might happen in their provisions during the voyage, as is done in the Royal Navy, would it not tend greatly to prevent the frequency of this distress?"—These remarks of Dr. Lind's are of consequence, and should be regulating considerations with shipmasters, or others who may be deemed responsible.

CLVIII. Some good soup might be got by boiling the beef-bones with their marrow, in a machine constructed upon the principle of Papins' digester. The addition of a little barley or rice, with some aromatic seed or vegetable, would improve it considerably. If the flesh has been long salted, the bones and marrow will have become less fit and proper for the foresaid purpose. At sea, where many comfortable assistances are cut off and inaccessible, ingenuity must work for the benefit of those requiring such aid and supplies. The commander and all officials ought to operate unanimously and vigorously for the advantage of the necessitous, and those under the influence of affliction. The foresaid functionaries should act in consonance, and their labours will thus have the happier prospect of being crowned with success.—

As hinted in the preliminary observations, advancement of human knowledge, when judiciously contemplated, would seem progressive. Discoveries are perpetually declaring themselves, whereby either the comfort or happiness of mankind may be promoted or maintained. This is a gratifying consideration even to the poor sailor; for some few years ago it would have been thought impossible so to prepare meat, or even vegetables, as to render them susceptible of a prolongation of preservation. But, as an encouragement to industry and indefatigable perseverance, it is known, that a piece of meat boiled or prepared in its own juices, and then defended with congealed fatty matter, and secured from the access of air, may be carried from London to Canton, on the Chinese frontiers, and afterwards the dish relished in the British Channel. This is not propounded from hearsay, but from autoptical observation.

CLIX. It is found from experiment, that bones contain a considerable proportion of cartilaginous or gelatinous substance; and, by chemical operation, the other constituent parts of the osseous structure can be separated; and thus, the forementioned part of their composition can be obtained for alimentary purposes. The following quotation is from a modern chemical work of some celebrity: "If a piece of bone be digested in dilute muriatic or nitric acid, the gelatin and earthy matter are dissolved, and there remains a firm cartilaginous substance, presenting the figure of the bone. If the acid be much diluted, the earthy matter only is dissolved, and the gelatin and cartilage remain. This has been employed by Darcet, as an economical method of procuring the animal matter of bones for nutrition, and is preferable to the converse mode of extracting the gelatin from the earthy matter by strong boiling, as in the latter the extraction is only imperfect, and the continued heat gives an unpleasant taste. The process he employs is to submit the bones to very dilute muriatic acid, and after the earthy matter is dissolved, to wash the residual gelatin thoroughly with cold water. It then dissolves easily in water by boiling."—" The proportions of the principles of bones must be variable in different states; in the bones of young animals, the gelatin and cartilage are in larger proportion than in more advanced age. The quantity of gelatin extracted by boiling in water, is from 25 to 50 from 100 parts of the bone originally submitted to experiment."—The marine surgeon should be acquainted with those possible resources which may contribute to his assistance when placed in difficulties. How far the gelatinous substance obtainable from the bones of salted meat may be answerable, is perhaps hitherto not determined; but it is adviseable to keep in view every plan which even promises the probability of being serviceable.

CLX. Superadded to all these considerations, descriptions and explanations, some additional instructions may be introduced by way of commendation, elucidation, and recapitulation. The preceding observations might, perhaps, have been more extensive and expressive, but this was justly deemed unnecessary. The most applicable arguments for distinctness in management, and perseverance in the way of improvement, in this part of the undertaking, have been propounded, and most unfeignedly recommended. Several additional observations on the filtration of water (a most important subject,) might have been inserted; but sufficient, it is presumed, have been advanced to establish the general principle, and to explain the propriety, and illustrate the necessity of its invariable, universal, and faithful observance and performance. From carelessness with regard to the article of water, much mischief has been done, both in the impairing of health, and in the aggravation of complaints already subsisting. If the whole supply of water for a ship or fleet setting out on a long voyage or cruise, should unluckily be impregnated with improper or heterogeneous substances, the consequences may be mischievous and incontrollable, as they have it not in their power to obtain the article possessing suitable properties till the completion of their destination or undertaking, and perhaps, even then, sometimes with difficulty. This consideration of itself should be a powerful inducement to have the water of a satisfactory goodness before embarcation.

CLXI. As the subject under consideration, therefore—namely, the alimentary supplies intended for seafaring people—is a matter of the greatest moment, an abbreviated recognition, comprising some further notifications of the antecedent reflections, may here be admissible. With all commanders, then, of whatever denomination or qualification, it is a consideration of indispensable importance, before all voyages of departure, positively to ascertain that every article be furnished of suitable quality, and in sufficient abundance. A commendation never to be disregarded or overlooked, is, that it is impossible to bestow too much attention upon these subjects. Upon the original properties of these materials, healthy or diseased condition may, in a very high degree, be depending. Amongst seamen, this is one of the principal considerations demanding attention, for the assurance of immunity from sickness: the demonstration of this brotherly kindness will likeways be powerfully conducive to a cheerful obedience of command. The station of commander is one of particular importance; his behaviour and management will have more weight with a ship's company than what is easily conceivable. If he is neglectful of his crew's happiness, or even their common comforts, he can hardly be guilty of any thing which will more effectually ensure their disaffection and discontentment. But, so much has already been advanced upon this collateral but important subject, that here enlargement seems unnecessary.

CLXII. Accustomed habitudes require, that there should be occasional diversity or variety in dietetical ministration. A continual and unchanging sameness of food gradually becomes disrelished and offensive. Considerable advantage will commonly redound from a judicious arrangement and distribution of seaman's victualling. By a skilful management, each day of the week may have a lesser or greater difference from another. Some judgment and knowledge will be necessary to combine those vegetable and animal substances which are the most suitable or congenerous, or even the most palateable. A single article may be prepared and presented in diverse manners; for example, rice may be taken by itself, in pudding, flummery, in broth, in curry, in bread, &c.; and all the other grains are susceptible of some agreeable differences in their preparation. This variation should be permitted in breakfast, in dinner and supper; and, therefore, the advantages obtainable will become universally applicable, and thus, to many, gratefully beneficial. A judicious attention to these circumstances will be of singular advantage. A formality, when once established in many ships, is allowed too commonly to predominate. The unchanged sameness of dietetical ministration frequently becomes displeasing, if not disgusting; and, therefore, an agreeable alternation or interchange of the different articles of diet, will be at least acceptable. The advantages of a skilful cookery will be not the least considerable. Commanders, and those officially interested, should never think this subject below their assumptive importance, and undeserving of their consideration. When the common sailors observe this friendly interference on the part of their commanders, it will, with them, constitute a powerful inducement to obedience and unalienable attachment.

CLXIII. Although the ars medendi, and the ars coquendi, are not consentaneous, or immediately associable departments, nevertheless, as good cookery is greatly conducive to the purposes of health, so, likeways, it is frequently collaterally and powerfully contributive to the practitioner's successful administration. On shipboard, formality, in opposition to all wholesome improvements, is commonly and too often injuriously predominant. An apparently indifferent article of food may be much meliorated by a careful process in cooking. All vegetables which have been previously dried, should, before they are submitted to the operation of boiling, be for some time immersed in warm water. The preparing of them in steam may, however, preclude this necessity, and, if the whole process be knowingly conducted, their sensible properties may continue excellent. By the assistance of steam, most vegetables requiring boiling may be speedily and thoroughly prepared. It has been considered improper to expose potatoes to the influence of vapour issuing from water in the state of boiling Agreeable to the common processes of preparing victuals on shipboard, sea water is generally employed. As, in the apparently unavoidable circumstances of a sea life, the quantity of fresh water requisite would commonly be with difficulty allowable, so, the use of the salt water for boiling many substances has become common, not only in the currency of voyages, but even frequently in harbour. The assistance of a suitable contrivance would very conveniently mend this imperfection. Marine water, during the process of boiling, is, as other water, converted into steam. This steam or vapour condensed, is deprived of the saline matters which salt water naturally contains; and, by the confinement and condensation of this vapour, in a contiguous part of the apparatus, the sufficient temperature of 212° being still maintained, the vegetable in exposure to its regulated influence may be as properly prepared as if fresh water had been originally employed. This mode will be peculiarly adviseable and applicable for all substances which have been long salted, as in this way a part of their saltness may be dissolved and removed. Salt water, however, may be more useful for boiling some matters than fresh: potatoes, for example, are often considerably improved by the addition of some salt during the operation of boiling.—The neatness and cleanness of all these culinary processes cannot be too particularly recommended. The general doctrines of the business being delivered, little more can here be expected. The preparation of individual substances, their multiplied combinations, their differences of management and treatment, may be collected from the observations previously proposed, and many circumstances will be manageable from instructions deriveable from other sources of information, and inconsistent with this undertaking.

CLXIV. In allusion to Dr. Lind's discovery of distilling salt water, so as to make it potable, or fit to be employed as a common beverage, it may be remarked, that he makes the subsequent observations: "The benefit of this discovery is not confined to ships at sea. It is a subject which, on many other occasions, deserves the most serious attention; as will sufficiently appear from the following extract of a letter sent me from the Havannah, dated the 1st of September, 1762: Before the surrender of this place, our distress, for want of water, became inexpressible. I would have given, with pleasure, half-a-guinea for a pint of such distilled sea water as I have frequently drank at your table. Numbers of our men died from a real want of water, and many more from drinking water which was unwholesome and poisonous.—On similar principles to those of obtaining fresh water by collecting and condensing the steam of sea water, it becomes necessary to recommend, in cases of a scarcity of fresh water, the employing of that steam for cooking of the provisions, without attempting to condense it; which will prove a great means of saving the fresh water. In the steam of boiling sea water, most sorts of provisions, fresh or salted, beef, pork, fowls, rice, vegetables, &c. may be stewed or dressed, equally well as in fresh water. For this purpose, they may be put into a net or a cullender, (colander,) and placed in the mouth of the pot containing the boiling sea water—as the Turks dress their favourite dish, a pillau—or they may be suspended on hooks in the boiling pots, so as not to touch the sea water, the steam being confined by a tight cover." And he adds, in another paragraph, "When a quantity of provisions are (is) to be dressed, the best method will be to convey the whole steam of the boiling water into another vessel, by means of a pipe. In this last vessel the meat should be suspended in nets or on hooks, in such a manner, that the brine or drippings, if the meat be salted, may fall into the bottom of the vessel, and the steam be equally received by the whole."—So far the benevolent intentions of the late Physician to Haslar Hospital. Those who wish his information relatively to the means of obtaining fresh water by distillation, must be referred to his own observations.

CLXV. The adaptation of steam to, and employment for, the purposes of cookery, is a consideration of remarkable importance, and more especially in vessels of the larger dimensions, and which commonly implies numerous ships' companies. By judicious management of a suitably contrived apparatus, with the assistance of one moderate fire-place, all the cooking necessary for the largest vessels may be conducted. The use of steam as a vehicle and source of heat, was altogether unknown to the ancients. The advantages of it, when conducted on scientific principles, to the moderns are considerable and manifold. The enumeration of these would be inconsistent and unnecessary. When steam is conveyed into water, it is condensed, and by the extrication of the latent heat occasioned by the condensation, the temperature of the water is raised so as speedily to equal the boiling standard. In processes of cookery, in which much boiling, stewing, &c. is required, the saving of fuel is frequently a consideration of moment; and, by having a common boiler, from which the vapour is conducted by tubes, the loss of heat is less than if fire were applied to each vessel, and the whole contrivance will be less expensive. In this manner, by supplying the vessels intended for boiling with the necessary quantity of water, and then throwing in the steam, the water will soon be brought to 212°, or the point of boiling. The tubes being constructed with stop-cocks, the communication of heat to any particular boiler, &c. can be occasionally interrupted, or even in proportion to the quantity conveyed, will be susceptible of some degree of modification. By having the vessels surrounded with substances which are bad or slow conductors of caloric, (such as brick-work,) the heat will thus not be so readily dissipated from their surfaces. If, from the continuation of the process in any one of the boilers, the quantity of liquid should become redundant, this could conveniently be prevented by drawing off some of the heated water at the bottom. It is almost unnecessary to observe, that, if salt water be employed in the *common boiler*, the steam will be fresh; but after the boiling has proceeded a certain length, the water will become too saline, and a supply of new water may be adviseable, which can be brought to the boiling standard before its employment.

CLXVI. The moderate consumption of fuel, therefore, is sometimes aboard ship highly desireable; and, by accommodated contrivances, this end, in a very considerable degree, as mentioned, may be accomplished. The operations of boiling, stewing, seething, roasting, baking, &c. may all be, at same time, proceeding by the influence of a fire of even moderate magnitude. The machine invented by Count Rumford, and intituled the perpetual oven, in which different compartments are constructed, and by particular management any subdivision, or the whole, may be heated together, would in probability be very serviceable. By constructing an oven of sufficient amplitude, a quantity of fermented bread may be prepared every morning, adequate to the consumption of the largest ship's company. An allowance of good fermented bread, even although it should only be occasional, would nevertheless be an agreeable change from the common brown biscuit, which is generally supplied. In the French naval service, the supply of wheaten bread is said to be permitted, and they have contrivances for its extensive preparation. The same method might be employed in the British Navy, or even in merchant vessels, such as those engaged in the East India Company's service, or more commonly, in most merchantmen. This proposal will be more particularly applicable when they undertake distant voyages, or when they expect to be long deprived of obtaining the desireable supplies. In coasting voyages it is not of such importance; for in the cooler weather of this country, bread may be preserved for some time in tolerable condition. Bread prepared from good flour, and properly fermented with the assistance of yeast, is found to keep longest without turning sourish or acidulous; depending upon the evolution or formation of the acetic acid, modified from its combination with other substances.

CLXVII. As it is perfectly confirmed by enlightened observation, and protracted and profitable experience, that a continual employment of salted, and sometimes putrescent provisions, commonly sooner or later generates a distempered disposition, and more especially an inclination to scorbutic complaint; hereupon a powerful argument is instituted, commending and enforcing suitable attention to procure, when practicable, supplies of unsalted animal and succulent vegetable materials. And if the people are to remain in a particular harbour for any length of time, it may be expedient, for the two first days, to conjoin the different aliments, salted and recent; of this description, the farrago nominated a sea-pie is an example. By this procedure, there will be a prudent passage from one condition of diet to another, and which mode of linking the union may be preventive of some inconveniencies. After men have been confined or restricted to sea diet for four, five, or even six months, as has happened in protracted passages to the East Indies, or in tedious cruises, blockadings, &c. when they are afterwards presented with a supply of fresh provisions, they generally devour them greedily and voraciously. In this manner they frequently bring on complaints of variegated descriptions, conformably to the nature of the individual's constitution, or the particular state of his constitutional circumstances and accommodation, &c. The surfeiting may, in one person, produce sickness and oppression, with a smart fever of short duration; in another, perhaps, looseness may be the consequence; and in a third, not improbably, the inconvenience may be loathing and vomiting, with headache, &c. but the disturbance is ordinarily soon terminated. In the warmer climates, however, the consequences of these irregularities are commonly of greater importance; and if, along with the sudden change of diet, they have indulged freely in the use of the fruits, spirits, &c. of the country at which they may have arrived, intestinal complaints, as elsewhere explained, will sometimes prove troublesome.

CLXVIII. The influence or effects of marine diet generally display themselves after a moderate continuance of its employment. This allusion, it may be observed, is for the present applied to people possessing, previously to their embarcation or beginning of voyaging, complete exemption from any particular complaint. These consequences of sea diet are regulated, very materially, in the speediness of their appearance, their mildness or aggravation, &c. by the state of constitution, and the predominance or remissness of other prejudicial circumstances. Amongst those exposed to the forementioned circumstances, and imperfectly furnished with suitable victuals, the diseases may appear, or be prevalent, in any situation thus favourable to their production. The primary affections generally presenting, are diseases accompanied with a modification of inflammation dispersed upon the surface, under the form of stigmata, pustules, pimples, abscesses, carbuncles, &c. &c. These happen especially upon the fingers, hands, arms, axillæ and breast, &c. feet, ancles, legs, thighs, buttocks, &c. The pimples, pustules, &c. frequently terminate very rapidly in the formation of matter. Those about the hands are commonly very painful;

and the moment matter fluctuates, an opening should be afforded for its discharge, and which will thus be a preventative of much uneasiness. In these instances, it is serviceable to evacuate the intestines; prohibit the use of grog and animal materials; and suitable vegetable substances should be vicariously administered.

CLXIX. The more ordinary and perceptible consequences of these provisions are sometimes observeable in five or six weeks, but more commonly from the sixth to the tenth and twelfth week after the beginning of their assumption. If it is lawful to deduce precepts from personal observation, performed with solicitous attention, it may here be suggested as a prudent measure, and even a precaution of interesting consequence, that seamen be allowed a certain proportion of fresh victuals every tenth or twelfth week, when practicably obtainable. This allowance would constitute a beneficial prophylactic, and ensure, in a very wonderful degree, both their healthiness, and consequently their usefulness. They have continued much longer, it is sufficiently understood, without obtaining these salutary supplies, and in many of sound bodies little appearance of mischief induced; but the constitutions and respective capabilities of many of inferior health or original firmness, have almost as constantly been impaired. A friendly attention to their diversified necessities, and supplying them with the requisite auxiliaries, will evidently and pleasantly compensate for all the additional trouble and expense. In voyages to the East Indies, for this purpose the Cape of Good Hope will be the most opportune diversorium. This assistance from suitable alimentary supplies, will operate strongly in the promotion of healthy quality, and prevention of distemper unrevealed. A necessary precaution, however, must be suggested, that the avoidance of fuddling potations and disorderly behaviour be regularly established and unceasingly maintained. Inattention to these circumstances will more than counterbalance the desireable advantages. The drunkard and gormandizer will, by their irregularities, have procured to themselves an additional proportion of imbecility, and consequently a proneness favourable to the occurrence of multiform indisposition. And towards the termination of the outward voyage, the amount of their services will be materially diminished.

CLXX. Fruitage, being so commonly to be obtained in temperate and tropical countries, extensive supplies of those species most convenient, when judiciously administered, will be beneficial. Oranges, lemons, limes, pine-apples, grapes, &c. will generally be the most suitable, and consequently productive of the most advantage. Immature fruits, however, should commonly be carefully declined. They frequently, when imprudently employed, and especially in those not much accustomed to fruit, or in particular conditions of their constitutions, produce troublesome complaints of the stomach or intestines, &c. These accidental consequences will sometimes, if not understood or mismanaged, terminate in severe or even dangerous distempers. It has often been observed, that when sailors arrive at a place where they can procure different kinds of fruit, that, by an immoderate use of it, they frequently bring on diseases of the bowels, or sickness at stomach, and febrile commotions ; which latter are for the most part of short duration. The complaints of the intestines are occasionally of more importance, and, if improperly treated, may pass into dysentery, with all its troublesome consequences. In combination with the unguarded use of different fruits, to which they may not have been accustomed, the undue assumption of large quantities of fresh animal matters, such as fish of different kinds, or even of mutton or beef, and still more if of pork, often operates in the production of the inconvenient consequences. Although a ship's company may have apparently possessed tolerable health before arriving at a particular anchorage, yet soon thereafter, if some of the forementioned circumstances have occurred, many affections, thus contingently introduced, may become remarkable. In general it may be observed, notwithstanding the preceding remarks, that, in proportion to reasonable quantities and suitable qualities of those vegetables, fruitage, &c. which can be procured and exhibited in a voyage, it is allowable to suppose an exemption from disposition to disease, but especially to scorbutic disorder, will be the satisfactory consequence.

CLXXI. In the present condition of human science, it is inevitably necessary to employ even those provisions which, from experience, are known to induce, by their prolonged employment, a certain disordered state among seamen, or others liable to their influence. Notwithstanding this conclusion, the most efficient in the prevention, or even retardation of this hurtful disposition, when they can possibly be obtained, should certainly, from very powerful considerations, be carefully and judiciously administered. When the animal part of provisions is of the finest quality, it will have less influence in generating a proneness to distemper than that possessing opposite properties, or which has been impaired by putrescent alteration, &c. Whatever may be the immediate causation of that hurtful alteration, whether deriveable from the particular deranging and resolving operation, which always happens in the lifeless remains of animal materials, and especially if they have been kept too long before seasoning, or this latter improperly or carelessly accomplished. In these circumstances, putrescence, in a certain measure, will be the observeable consequence; and, therefore, the mischiefs resulting from the use of such victuals will be increased. The peculiar changes happening in animal matter by the decomposing operations silently and secretly proceeding, have not been explained, and here no satisfying or instructive information, it is confessed, can be suggested. Similar observations apply to vegetable substances. Many of them are suffered to undergo a chemical change, before they are considered in a fit state for seasoning or preservation. Those substances which, from observation, are understood to be most perishable, should, on this account, be first consumed. These observations may appear to many unmeaning and unimportant, but the more the subject is explored the more fully and clearly it is comprehended; their importance and usefulness will be the more particularly and irrefutably conspicuous.

CLXXII. With regard to the effects of sea salt upon animal matters, when employed for their seasoning and preservation, Dr. Trotter offers the following remarks: "I believe it is still a question in dispute, whether sea salt undergoes any change in the animal body; but it would not be an easy matter to ascertain it by trial. Some experiments of my own convince me, that salted provisions, such as are generally used in King's ships—beef for instance—seems to have undergone some very material changes from the salt, before it is taken into the body. This does not depend upon the beef approaching nearer to a state of putrefaction—for great care is taken that no damaged provisions shall be served to seamen—but there is a chemical attraction between the beef and sea salt. Indeed something of this kind must have been expected to take place, otherways it could not have been preserved: this is what, in common language, is called *taking on the salt;* for if it happens to be too long kept, the elective attraction between them is destroyed, and the meat putrifies. My situation at present, however, does not enable me to prosecute my inquiry in the manner I could wish; but should any chemist undertake the experiment, I beg leave to recommend him to use that kind of beef which has been kept above two years. It is curious to observe the effects of salt on meat preserved for this length of time; in some pieces which I have examined, the whole bone, in particular, seemed to have undergone alterations, and little more was left than the mere earth;" (he should rather have said, the cartilaginous, &c. proportion,) "from which circumstance, the fleshy parts also must be considerably changed in their nature. The cylindrical bones are not so soon affected with the salt as those of a softer texture, such as the breast bones and ribs. But these facts render it highly probable, that a double elective attraction takes place here, and consequently a change in both substances. If this is the case, it is likely there was some mistake in Doctor Lind's recovering the marine salt pure from the urine of scorbutics. He did not make any comparison between the quantity taken in and that recovered; the fluids, no doubt, might already be loaded with so much salt as to assimilate no more, and, therefore, it might pass off unchanged by the kidneys. Doctor Cullen's opinion perfectly agrees with that delivered above. He says, 'Even supposing such salt to suffer no change in the animal body, the effects of it may be considerable.' This must be readily allowed, though we should not be able to account for its operation." It is not improbable, that in the production of scorbutic symptoms, thanatode or nitrogene has considerable influence.

CLXXIII. At paragraph XLV the article fish was mentioned in general, but a few remarks upon the subject, before bringing these scattered observations upon alimentary supplies to a conclusion, may not be improper. Fish is often furnished in merchant vessels, when in a salted, or even, occasionally, putrescent condition. That kind denominated stockfish, or dried cod, is most commonly supplied. Fish, in a dried and putrescent state, would seem more speedily and materially to influence the general condition of the constitution, than even flesh, when kept by salting. Scorbutic disposition is thus very commonly and injuriously engendered. This is a common complaint in the country ships, as they are styled, in the East Indies, where the religion, or rather idolatrous ceremonies of the natives, constrain them to use fish exclusively, as the animal portion of their victuals; and even this is frequently putrescent before its employment. Rice, and fish in this state, constitute their chief alimentary support. It is not uncommon for such fish as has been considered unfit (or indeed disrelished and rejected by European seamen,) for use in vessels proceeding from Europe, to be purchased for the use of the native sailors in these country vessels: any thing is considered good enough for the miserable lascars, as if they constituted no part of rational mankind. These unhappy creatures, likeways, commonly wallow in unrestrained nastiness: this materially adds to the mischief. From their natural colour, it is difficult or impossible to judge of external scorbutic symptoms, as manifesting themselves in superficial discolorations; and, therefore, some other circumstances must be brought into consideration. When affected with scorbutic disposition, their inferior extremities are commonly more or less tumefied, and they appear debilitated and vacillating. Their distempers are sometimes sudden in their occurrence, and rapidly advance to a fatal termination: but here it is not intended to enter into an examination of their complaints. It may, however, be subjoined, that when their disorders are properly understood, and seasonably treated, they are commonly not difficultly removeable. As it is customary, in warlike times, for lascars to form a proportion of ships' companies in the returning voyages, and commonly the whole of the country ships' excepting officers, the management of their dietetical allowances is a consideration of indispensable importance. How many of these unlucky mortals have been destroyed, without any other regret than for the loss of their numerical strength, from inattention to their circumstances!

CLXXIV. In particular circumstances of the health of a fleet, the following observations of Trotter may sometimes be beneficial, and at all times deserving to be kept in contemplation. "1st. In lieu of butter and cheese—which of late have been with difficulty procured—and oatmeal, let cocoa and sugar be allowed for breakfast, as on West India stations. Or let sugar or molasses be mixed with the burgoo, or oatmeal gruel, that the use of them may become general, by being made palateable. Query.—Why is oatmeal supplied if seamen refuse to eat it? Rice and sugar have been lately substituted for butter and cheese, but the people dislike them. 2ndly. Let the beer which is to be carried to sea be made of double strength, with a larger quantity of hops to make it keep; and let two quarts be served, instead of a gallon, of the small beer: which would make the expense equal, and not even occasion a single inconvenience in the forms of office. 3dly. Whenever the ships return to port, let them be served abundantly with vegetables in the fresh beef broth. This is still a *desideratum* in the diet of seamen. The quantity ought to be specified, and not left to the discretion of a purser, or any other officer, to withhold them altogether when they grow dear. 4thly. Let some of the cheaper pickles be supplied, such as red cabbages, walnuts, cucumbers, &c. and let them be served in allowance with salt meat. These are cheap articles, and fine correctors of salted diet. They are much to be preferred to sour krout; grateful to the taste, need no washing or cooking, and quench thirst when water grows scarce."—Every ship going for a length of time to sea, should carry pickles for the use of her crew. A great variety of vegetables is susceptible of being pickled, and may be very serviceable to the seafaring. This precaution, however, should be carried along with those procuring or preparing these articles, that they are often impoisoned by a coppery impregnation, and in this condition may be extensively mischievous. "5thly. Let lemon-juice be supplied to the surgeons for the cure of scurvy only. Cases of scurvy are now appearing in the fleet, and were they supplied with lemon-juice, the whole might be cured on board." The propriety of the last consideration is of uncommon importance; for, as already observed, the Public Marine Service has lost much by sending many seamen to hospitals. But the subject may be so completely understood from the general tendency of these observations, as not here to need any additional illustration.

CLXXV. In reference to the protection of health, or even the removal of disease, when actually incurred, the following remarks of Trotter upon Captain Markham's sick mess may not be unavailing. The following is extracted from a letter addressed to the Secretary of the Admiralty on the subject. "Having at different times, in the course of my attendance on the fleet, represented to their Lordships the very great advantages which the sick of the different ships at sea would derive from the use of fresh meat, a better wine, porter, vegetables, and fruits in season, it has hitherto happened, that the method of obtaining this supply has been objectionable, and, consequently, it was only followed up for a short time. But having still kept this object in view, and the wants of the fleet having been greater for the last two years," (the letter is dated May 8th, 1800,) "than at any period during my service, I have now to request the attention of their Lordships to a plan which has been already practised in a single ship, and which, by meeting with the countenance of their Lordships, could not fail to become general throughout the navy, to the incalculable benefit of the sick-bed, and to the public service. The plan is to establish a mess for the sick, by the consent of each ship's company, which is to be done from the salted provisions, &c. which the sick are unable to use, when indisposed and confined to the sick-berth. There are numerous diseases, when it is either improper for the patient to use the ship's diet, or when, from want of appetite, he dislikes it. A large allowance, therefore, goes to his messmates, which, if not devoured by them, has often been sold on shore to disadvantage. Now, instead of this superabundant allowance being given to a man whose appetite rejects it, or to his messmates, who may sell it for bad purposes, Captain Markham of the Centaur has been long in the habit of directing the purser to keep a book of credit for all such provisions, from a list daily furnished by the surgeon, which credit goes to the use of the sick, and is converted into a fund for supplying live stock, whether sheep or poultry, porter, vegetables, fruit, &c. when the ship goes to sea; from this also new bread is daily baked for the use of the whole." And Dr. Trotter adds in a note: "The fund of a mess, well supported and encouraged, in most ships would even afford to keep a cow for the use of the sick, which would certainly be the first and greatest comfort that could be bestowed.—Their Lordships may form some idea of the good to be expected from this plan being made general, from the following example. When Captain Buller, in the sickly condition of the Edgar last February, gave up his private stock to the sick and convalescents from the prevailing fever, it was remarked, that in the space of ten or fourteen days, the most debilitated cases were able to return to their duty. Upwards of fifty recovered at sea in this manner, being the first and worst, and under all the disadvantages of bad weather. When the Edgar came to port, she landed, in all, about 150 other cases; and after these had been from six to ten weeks at an hospital, only eighteen were returned to the ship. Many of the number were invalided, some of whom were afterwards seized by Captain Buller, whom he found in good health. Such are the defections of a ship's company, when, from deficient comfort on board, they are sent on shore. The plan of a sick mess, such as I have proposed, in imitation of Captain Markham, must go a great way in preventing such misfortunes as are the consequence of sending men to hospitals. It interferes with no forms of office connected with any of the inferior boards, but leaves the people entirely in the management of their officers, a circumstance I consider much in its favour. At the same time I am of opinion, that it could not be easily brought into general practice, without the approbation and countenance of their Lordships. If a sick man can be done justice to in his own ship, he certainly ought never to be sent out of her: but no article in the *materia medica* can make up for the want of fresh provisions."—These remarks are of importance, and the amendment partly adopted, if generally introduced, which does not seem to be impracticable, would be extensively beneficial. They have been quoted as emanating from one, a person intimately acquainted with the Medical Condition of the British Navy, and whose opportunities for observation and information were extensive.

CLXXVI. Sugar and Tea are also occasionally furnished, but not generally for ships' companies; and, in the navy, most commonly for the use of the indisposed. The leaves of the Chinese shrub, which now produce such an extensive lot of tribute to the British Empire, have been supposed to have variously beneficial, exhilirating, and other commendable properties; or, conversely, deleterious and mischievous consequences. Strictly speaking, it is doubtless an article of luxury, and might perhaps be usefully prohibited; but a depraved appetite, enslaved to pleasure, has now confirmed its extensive employment. The quantities of it commonly obtainable by seamen, are seemingly a consideration of indifference, and may, therefore, be given or allowed as an occasional and pleasant beverage. The sugar is a salubrious and nutritive substance, and should always be afforded in sufficient quantities. This article to the healthy is acceptable and beneficial, and to the sickly and ailing it may be considered both as an alimentary and medicinal substance.

CLXXVII. Several of the articles which may be useful to those labouring under distempers, the debilitated and the recovering, have been already enumerated. The judicious application of them and other auxiliaries and necessaries, is frequently of considerable importance. This practical conclusion is applicable both to those threatened with impending disease, and to the restoration of those lingering under the consequences of indisposition. A suitable assortment of these constitutes an absolutely indispensable part of every marine practitioner's apparatus medicaminum. All his most disinterested and indefatigable endeavours, his most assiduous attentions, his most perspicuous discriminations, his most appropriate and scientifical prescriptions, without these collateral aidances, will be utterly counteracted, and eventually disappointed. These are animadversions founded on observation and experience, legitimate and immutable as truth itself; whose contravention is sempiternally impossible, and whose authority is universally unconquerable.—In the ships employed by the East India Company, this deficiency appears to cause a most troublesome and unpardonable inconvenience: and whether this may arise from inexcuseable negligence, or from incompassionate and unwarrantable predetermination, it is well known, that, to the surgeons employed in that service, this constitutes the source of disagreeable and inexpugnable embarrassment. In no public service is their department, ordinarily, more skilfully superintended and conducted, and in none where surgeons commonly obtain less collateral assistance. Their circumscribed assortment of medicinal necessaries is ill calculated to preserve, to redintegrate, those sinking from insufficiency or unfitness of alimentary subsistence. " Sed prætereo, atque aliis post me memoranda relinquo."

CLXXVIII. After a man has sunk into a dangerous disorder, or who, perhaps, is miserably exhausted from the preceding devastating force of some severe malady, but which, by the fortunate assistance of medicinal efficiency, has been overcome or interrupted in its progression, the crude diet of a ship is altogether loathsome to him, and is absolutely unqualified for his restoration. These, (with many more which could be named,) then, are imperfections vehemently commanding consideration and immediate amendment. The reflection, too, becomes still more harassing and afflictive, when, probably, for the paltry sum of ten pounds, ten useful lives might be preserved! The subject becomes so displeasing, and ungratefully inauspicious in the examination, that the further consideration of it, therefore, at present, shall be relinquished.

> " Deficient *inopes* venæ *vos,* ni cibus atque
> Ingens accedit stomacho fultura ruenti."

CLXXIX. Some of the preceding remarks, with regard to dietetical allowances, are deduced from autoptical observation, and, therefore, are considered as invincible arguments. In former times, not only these supplies for the sick were insufficient, but what constituted a still more formidable inconvenience in scorbutic complaints, more particularly, was, that even lime-juice was not furnished in sufficient proportion. This is confirmed from the following authoritative communication: " For we thought that the ships of the East India Company, since Dr. Clark's time, had been supplied with every article in abundance to counteract the scurvy, or cure it when it broke out. Thirty-one men buried from scurvy in a single East Indiaman, during a passage to the Cape. The account is horrible! This is an expenditure of British seamen not to be endured. Let it be known to that affluent Company, that lemon-juice, prepared for the use of the navy, can be preserved for three years, and that the lives of these thirty-one men might have been saved for thirty-one shillings.—I am afraid that occurrences of this kind are very frequent in the ships of the East India Company: indeed the whole trading ships of this country require correction in this point. It is the nature of Trade to render man selfish; to chill the heart and narrow the affections. A commercial nation like this ought to have a Board of Health, to protect seamen in distant voyages, so constituted under legislative authority, that the power of gold could not abridge its benevolent spirit."—These observations are absolutely justifiable, and are additionally strengthened by the letters of the late Dr. John Hunter to the aforesaid Company.

CLXXX. In a letter dated June 19th, 1797, Hunter observes as follows: "It appears, upon the examination of the Surgeons' Journals, that the scurvy proved mortal, from many of the ships having neglected to provide themselves, as usual, with lemon or lime-juice. Of all the antiscorbutics which long experience, and much investigation, have brought to our knowledge, the lemon-juice decidedly holds the first place. It may, indeed, be considered as an absolute specific in scurvy; accordingly, no ship possessing it suffered from the disease; but many of the ships had either neglected altogether to provide themselves with it, or had it in casks, in which it becomes mouldy, and loses its virtues; and it was on board such ships only, that the scurvy terminated fatally. It is not possible to possess either a more certain, or a cheaper remedy for scurvy, than lemon-juice. It has been in use on board the Company's ships for almost two centuries; and during the present war, the Navy of England" (he would have said with more propriety and accuracy, the British Navy,) "have availed themselves of the information they received from the Company, and lemon-juice has been sent on board every one of His Majesty's ships, in which it has been found equally certain and efficacious, in preventing and curing scurvy, as on board the Company's ships. In a matter of so much importance, in which the health and the lives of the men are involved, in the first instance, and ultimately the safety of the ship itself, the increase of a few pounds expense ought not to come in competition with objects of so much higher concern. It would be an easy matter for the Company's ships to supply themselves, in India, with lime-juice, not only sufficient for the voyage homeward, but also for the subsequent voyage from England, if the price made it an object; for if the lime-juice be put up in bottles, it will keep perfectly good for several years. The expense of it in India would be very little; and the trouble not much. The purchase of the fruit would be a mere trifle."

CLXXXI. And in another letter he remarks: "Of *three thousand seven hundred and fifty-two*, the number of sailors forming the complements of *twenty-nine* ships, there died *forty-six* on the voyage outwards, that is, *one* in *eighty-one:* while in port, or going from one port to another in the East Indies, there died *eighty-five*, or *one* in *forty-four:* on the voyage homewards there died *one hundred and ninety-one*, or *one* in *nineteen:* and taking the deaths from the ships' sailing from England till their return, they amount to *three hundred and twenty-two*, or *one* in *twelve:* in the two preceding years the deaths were only *one* in *sixteen,* and *one* in *seventeen.*—This very considerable increase in the mortality of the seamen in the Company's ships, is chiefly to be imputed to the prevalence of scurvy. In the preceding years, I have had occasion to state, that scarcely any perished by scurvy; but that both in 1796 and 1797, many of the ships were neglecting the usual precautions against that disease; and, in particular, had no supply of lemon-juice. There is but too much cause to make the same remark in the present year; for there have died of scurvy alone *ninety-two;* and other diseases, by being complicated with scurvy, have proved more fatal. Many of the ships had no antiscorbutics at all, as the ( ) on board of which *fifteen* died of scurvy on the passage outwards. The means of preventing scurvy are well known, and have been investigated and established by observations and experiments, made in the Company's service. The Committee will, therefore, I trust, with their usual humanity, enforce the regular supply of antiscorbutics, on board of all their ships; and not suffer a disease, formerly so formidable to our sailors, but now vanquished, again to spread destruction through the Company's ships. No ship ought to sail without lemon-juice, put up in bottles; they ought also to have the materials for making spruce beer: and further, if the practice on board some of the ships (Mr. Bolton's,) of sending a quantity of porter or any other good malt liquor were general, it would have the best effects. The expense of preserving the lives of seamen, from this disease, is indeed quite trifling; a very few pounds, properly expended, being sufficient to guard even one of the Company's largest ships against it.

CLXXXII. "Of the recruits, or rather military (for they consisted chiefly of regiments sent to the Cape of Good Hope,) of *five thousand and sixty,* there died *sixty-one,* or *one* in *eighty-three.* In the two preceding seasons, the deaths were *one* in *two hundred and nine,* and *one* in *one hundred and twenty-nine,* and that among recruits, all sent to India." And the Doctor subjoins the following applicable observation: "For the preservation of the lives of the seamen in the Company's service, it has always been considered as of the greatest importance, that the surgeons of the ships, and their mates, should be men of good education, and that the surgeon should be a man of experience. The diseases which arise on board of ships, in the course of long voyages, and those which prevail in warm climates, are unknown in these countries. Young men, therefore, having the best education in physic and surgery in London or Edinburgh, can acquire no experience in those diseases, for they are not to be seen in our large hospitals. There was, therefore, much wisdom in the old regulation, which made it necessary, before any one could be appointed surgeon to a ship, that he must have been one voyage as surgeon's mate. But the encroachments upon this regulation have been annually increasing, during the war, from the difficulty, no doubt, of finding persons properly educated, to undertake the offices of surgeons and mates."—He then states some of the principal causes of these difficulties; the most material of which was the increase of pay and emolument, which has been granted to surgeons, both in the navy and army. From all these statements and the evidence which they comprise, it appears sufficiently confirmed, that the seafaring have frequently and shamefully suffered from inattention to those circumstances which are of indispensable importance to their convenience and preservation. And if these conclusions were applicable when Dr. Hunter wrote, how much more extensively would this be the case in the former periods of British navigation, whether conducted for the fulfilment of belligerent or commercial undertakings!

CLXXXIII. Forsaking this digression with sorrowful uneasiness, the conclusion of this department now approaches. By a suitable and sufficient allowance and application of the proper diet, &c. convalescents, &c. might very generally be more quickly restored to their health, and in this manner be happily rendered more speedily useful, which, as an independent consideration, is highly deserving of attention. Many threatened with disease or weakness might be supported and recruited, the sick list kept short, and the effective strength of a ship's crew be serviceably maintained. The co-operation of a few men may sometimes constitute and effectuate the possibility of accomplishing an enterprise or undertaking, which otherways might prove impracticable. —In returning voyages from India, China ships' companies are sometimes so much reduced in their effective strength, by disease and gradual exhaustion, that vessels are brought into danger from insufficient management. As repeatedly illustrated in this work, it is not any one consideration exclusively, however important in its simple capacity, that will be adequate to the continuance of healthiness—a combination of circumstances must be operative in its maintenance. The prevention of disease, therefore, implies a favourable conjunction of circumstances, of which diet, undoubtedly, constitutes a part of very particular importance: but, the continued use of that kind of diet commonly furnished to the seafaring, is apt to generate disease; and thus, other preventive measures become necessary; and of these *pure* air, cleanness and suitable clothing, and the requisite attention to the subject canvassed in some of the foregoing paragraphs, will be principally efficacious. And here it may be remarked, that, if debilitation or indisposition are carelessly or ignorantly allowed to go on beyond a certain pitch, the restoration of those implicated in complaint, with the common aidances on shipboard, will often be found difficult and uncertain.

CLXXXIV. Although the preceding observations must, indisputably and confessedly, appear without any systematic connexion, and perhaps too incomplete to communicate information, they have, undoubtedly, been proposed from charitable inclination, and have, in detail, exceeded commencing expectation. Two principal circumstances conspired to the production of these consequences. The first is, the impossibility of supplying a scientific and regularly consecutive description of the alimentary substances, generally allowed or furnished for seafaring persons, without going into an elaborate examination of the materia alimentaria, which would have been fruitless and unsuitable in this performance. The second is, that this subject has so frequently been under forerunning or antecedent investigation and description, and is now, peradventure, as well or better understood and regulated than any other relating to the common welfare of mariners, or even as applicable in the preservation of their healthiness. These grateful and beneficial amendments in dietetical allowances, have principally originated in the Public Naval Service of the Country, and continuing the late painful warlike struggle especially, and gradually did they become conspicuous, and in some measure appreciated. In no age or country were maritime contrivances and improvements, for the advantage of seafaring people, so remarkable and beneficially demonstrated as during the period abovementioned. From these and other considerations, the uneasinesses and annoyances of a sea life underwent some share of mitigation; and distempers became, happily, less intractable, less predominating; and, consequently, the whole floating defensive bulwark formed a magnificent organization, which has hitherto been unparalleled.

"Nec non ad ipsius victûs rationem moderandam, quam et Hippocrates et Celsus rerum ingestarum primam esse putant regulis legibusque medicinalibus subjectam: eò scilicet ex ipsa rei natura inducti; quum ne ægri quidem, adhuc rudes et ignari, abstinerent se cibis, quos quidem non minùs ad rectæ valetudinis, quàm præsidium comparatos esse existimabant."

Thomas Simson, De Re Medica.

CHAPTER FOURTH.

OBSERVATIONS ON CLOTHING, BEDDING, EXPOSURE, &c.

"Et pleraque contra frigus ex suo corpore vestiuntur." "Vestimentorum sunt omnia lanea, lineaque, vel serica, vel bombycina," &c.

I. And although the two foregoing important points of investigation are principally and immediately applicable, and even essentially necessary to the physical subsistence, preservation and happiness of mankind, nevertheless, the employment of clothing—variable in quantity, conformably to circumstances—in the progressive continuance of their temporal existence, has imperceptibly become commendable for concealment, and indispensable for sheltering and defensive purposes. The human race, in their primeval simplicity, were not subjected to the ordinance of this necessity; they lived in a state of nakedness, and, from the appointment then applicable, this unadorned exposure was allowable without the imputation of impudence or immodesty. This original simplicity was of short continuance, and this remarkable demonstration of uprightness and incorruption was superseded by the approveable and requisite use of garments. "And they were both naked, the man and his wife, and were not ashamed." This refers pointedly to the primitive state of simplicity and innocence, which was, unhappily, supplanted by one of a very opposite description. "And the eyes of them both were opened, and they knew that they were naked; and they sewed fig-leaves together, and made themselves aprons." But, alas! with the numerical simpleness of mankind, their innocence likeways suffered or underwent an irreversible deterioration, which has been the fruitful source of all mankind's subsequent and perpetual misfortunes.

II. Two general arguments seem to operate in suggesting the propriety and employment of habiliments: Physical necessity, first introduced by the peculiarity of situation, and other accompanying circumstances; and thus, the form and quantity of dress have varied, in all ages and in all countries. And the second consideration is, that instinctive sensibility, leading to the avoidance of whatever is shameful, or conducing to degradation, in the estimation of others, from unbecoming exposure. This sentimental disposition suggested and regulated the primitive use of garments. These two predominating considerations, therefore, may be contemplated as dictating and commending the use of investments. These two circumstances are, conjunctively and principally, operative amongst all nations possessing a moderate proportion of civilization. The implanted disposition, the instinctive principle so powerfully dissuading from all immodesty of behaviour, and multiform concomitant necessity—the latter superinduced by the influences of particular climates, in all their variations—have thus conciliated the use of clothing, and thoroughly demonstrated its propriety and usefulness.

III. The observations and descriptions of travellers, voyagers, &c. announce the almost universal use of more or less clothing amongst the diversified hordes of mankind. The most barbarous and untutored, even those living in primogenital rudeness and unconquerable savageness, commonly use some rags for the purposes of concealment. Those miserable creatures, which assume only the unpolished semblance of humanity, but none of its more refined or cultivated attributes, and who live in universal unshrouded exposure, may truly be considered as in the most lamentable and unfortunate state of irreclaimed wildness. But even this mournful description is only applicable to the savages of the milder climes; in the colder regions they are obliged to employ some rude coverings for their protection. In all the countries northwards and southwards of the tropics, different quantities of clothing are rendered eligible and necessary, according to the succession of seasons, and their continual variation. In the countries situated between the tropics it does not appear to be so much required, and certainly not so much employed. In these districts, indeed, the natives commonly use panniculi—the langooty of the Asiatics, for example—for concealing those members which ingenital pudibund sensibility has ordinarily suggested the propriety of secluding. In civilized countries, garments or general coverings are constantly employed. These consist of different materials, according to capricious fashion, or the peculiar productions naturally supplied in particular territories or climates, which may be convertible into habiliments.

IV. It appears to be an indigenous physical property of particular countries, to produce those articles most convenient or suitable to the formation of garments applicable to themselves. At least this, with some occasional exceptions, seems to be an allowable conclusion. Or the subject may be expressed in a different manner: those vegetables and animals affording materials adapted to clothing in the warmer climates, and in those latitudes commonly reputed temperate, are copiously furnished in these territories; and those, again, which supply the warmest clothing, are natives of the more distant variable and inclement latitudes inclining towards the southern and northern boundaries. In the more constantly inclement of these territories, the inhabitants are especially indebted to the shaggy animals of their own climates for their most serviceable and comfortable investments. The particular circumstances of different countries seem to have regulated, at least, in some measure, and in all ages, the articles used for clothing. The day has been, when the barbarous inhabitants of Britain wore the rough skins of animals, as ungenerous and unrefined as themselves. Cæsar observes, with relation to the ancient inhabitants of Britannia: "Ex his omnibus, longè sunt humanissimi, qui Cantium incolunt: quæ regio est maritima omnis, neque multum a Gallica differunt consuetudine. Interiores plerique frumenta non ferunt, sed lacte et carne vivunt, *pellibus*que *sunt vestiti*." By the progressive nature of improvement and refinement, as in ancient Greece and Italy, articles, the natives and products of distant regions, are now imported for the purposes of luxury, ornament, or defence.

v. The Hebrews were acquainted both with woollen and linen garments. The Grecians and Romans, likeways, wore these materials, when fabricated into commodities calculated for apparel; cotton, silk, &c. in the earlier ages, seem to have been to them unknown. These nations or people just mentioned, inhabited those regions of the earth which are generally considered to be temperate; but even these countries in contemplation are more or less liable to the operation of coldness; heat and cold, snow and ice, are commonly mentioned. Millions of the Asiatics and Africans, in their native countries, generally live without almost any covering, only occasionally lightly shrouded in the nocturnal coolness. The inhabitants of Iceland, of Lapland, the Russians, and the Siberians, &c. commonly use the teguments of the rough and furry animals, fellow natives of their own countries, for their protection; thus has provident Nature furnished substances fit for coverings to the human race, in the different territories. The sheep, that guileless creature, is naturally the inhabitant of climates that may be denominated temperate, or which, at least, once in the annual revolution enjoy a temperate interval, but whose winters always have more or less inclemency. The wool, its natural produce, constitutes the borrowed and artificial covering of many of mankind; and, from its comfortable protection in the colder weather of different countries, is, wherever known, greatly esteemed, and generally preferred. The Chinese, &c. may employ their silks, &c. and the Asiatics their cottons, &c. and the Europeans in their winter, and frequently even other seasons, may be indebted to the assistance of their woollen garments. From the universality of the commercial intercourse of man, however, there has been also an interchange of the materials applicable to the fabrication of clothing; so that cotton garments are found in the cold regions of the north, and those fabricated from woollen, occasionally employed in the warmest tropical territories.

VI. A probable conclusion from these occasional observations, is, that friendly Nature has supplied articles, suitable for clothing to mankind, in the respective climates in which they are natively produced. Mankind, in whatever part of the habitable earth, are thus capable of furnishing themselves with coverings peculiarly fitted to their extensively diversified localities and accompanying circumstances. The more remarkable advantages obtainable from clothing, are, in the warmer climates, in a certain measure, defensive or protective from the immediate influence of insolation, and also from occasional depressions of temperature; and in the temperate and other latitudes, sometimes to answer the former of the mentioned purposes, but more commonly to entangle and accumulate the heat extricated at the surface, and, therefore, intermediately to withstand the subduction or diminution of temperature. The nakedness of barbarity, or the partial covering of the slightly reclaimed, the langooty for instance, is no positive exception to the foregoing conclusion; for even such of mankind will employ general coverings, when they can procure them, for defending themselves against even a moderate degree of coolness.

VII. The materials from which clothing is most commonly fabricated, are wool, silk, cotton, flax, &c. and each of these has its respectively applicable proprieties and advantages. The woollen and cotton garments are more suitable to the changeable latitudes, than the other two articles just mentioned. The cotton is the substance most commonly employed amongst the inhabitants of the tropical latitudes. Sailors, who are more pointedly the subjects of these disquisitions, are ordinarily furnished with woollen and cotton garments. These general remarks being premised, a more particular examination of the clothing, convenient and appropriate to seamen, may now be subjoined. And, to present a tolerably distinct and pertinent account of this interesting subject, it may be expedient to consider it in the manner following: First, Observations upon the nature, qualities and quantities, of the clothing intended for seamen; and concerning the suitable management, conformably to the variation of weather or of climate. And secondly, Concerning the bedding of seamen, which is a much more important consideration than has generally been supposed. This part of the business, therefore, will include notations upon its nature, and the common inattention to its sufficient cleanness. And thirdly and lastly, Some observations, explaining to travellers and adventives in tropical climates, the propriety, or even necessity, of due attention to considerations of such indispensable importance, as the proportionate management of their clothing and exposure, and their adjustment, in conformity to the variableness of temperature and other circumstances.

VIII. CUSTOM—"Consuetudinis jus est quod voluntate omnium sine lege vetustas comprobavit." —which is a powerful determiner of the practical movements and observances of mankind, appears to have established a particular formality in the habiliments commonly employed by sailors, strictly so denominated. For example, the jacket must have a particular form and colour, and likeways the trousers; the neckcloth also must be put on in a peculiar manner; and he who does not regularly conform to its particular adaptation, is considered as not equipped in the genuine and knowing method of a true son of Neptune. Or, if not acceding to the foresaid formality, it becomes doubtful whether he may have been properly initiated into their mysteries. From a consideration of some of these circumstances, those who are intimately acquainted with the manners, movements, and habitudes of sailors, can generally pronounce whether they are experienced in their occupation, or if they are untaught landsmen. This conclusion is not always so correctly applicable as not to be liable to occasional exceptions, for even in the same professions and occupations of life, considerable discrepancies are remarkable in the severally constituent individuals. The seafaring, however, and especially when they have been long accustomed to that mode of life, progressively and imperceptibly acquire some expressively characteristic peculiarities.

IX. The following form of dress has been proposed by Dr. Trotter, to be used in the Royal Navy. " A general uniform for seamen has been mentioned in the valuable works of Lind and Blane, and supported by arguments so conclusive, that nothing can be offered against them. Amidst so many improvements in the navy, we are surprised that such a one as this has never been brought into universal practice. A uniform in all situations contributes so much to personal delicacy and cleanliness, that we are at a loss to conceive how our officers have neglected it so long: it is the more to be wondered at, as the most punctilious attention is now paid to the clothing of the people. The Hon. Captain George Berkeley, when he commanded the Magnificent, as a guardship at Plymouth, had his men dressed in a particular way: they were easily distinguished from others, and became proverbial for neatness of appearance, and orderly behaviour when on shore. Nay, so little have these ideas refined old habits in the service, that the navy slops are really made in a form that no sailor, who has any taste in dress, will put them on. But there are other arguments to be used in favour of a general uniform. It appears to me," continues Dr. Trotter, "that desertion would be very much prevented by it: at least, it would increase the difficulty of escape, as disguise could not so easily be assumed. The clothes might be manufactured of a particular kind of cloth; and an act of parliament passed, enforcing the same regulations and penalties as are usual in the army. The uniform should consist of a blue jacket, with a sleeve and cape of the same, and lined with thin white flannel: a waistcoat of white cloth, trimmed with blue tape: blue trowsers, or pantaloons, of the same cloth with the jacket, for winter; and linen or cotton trowsers, either striped blue and white, or all white, for summer: check shirt, and black silk neckcloth. A button of metal, or horn less liable to tarnish, with the letters R. N. upon it. The hat small and round, water proof, with a narrow belt, on which should be printed the name of the ship; which could be conveniently shifted when a man is turned over to another ship. An outside jacket, of a thicker texture, and flannel waistcoats, might be occasionally supplied, as a defence from cold and rainy weather. Such a form of dress could not fail to be acceptable to the seamen; and it would be highly pleasing in the eyes of officers and others. The crews of different ships would be known by the name on the hatband, which would make them emulous to appear clean and orderly: this again would increase attachment to the service and its commanders, and with these all the virtues of good discipline."

x. The qualities and quantities of the articles of clothing, should be regulated by the constitutions of individuals, and the particular circumstances of weather and climate. Woollen clothing will not generally be required betwixt the tropics: in these situations, those coverings fabricated from cotton are more agreeable and convenient. In these latitudes, indeed, cotton would appear to have been naturally appointed for the principal part of artificial clothing. It may be a subject of discussion, as it frequently has been, which of these materials, namely, wool and cotton, is the most agreeable and beneficial when applied next to the surface. These articles have their partisans and favourers, as likeways their declaimers and opposers. Concerning this important subject, information and instruction, which may be invariably applicable, cannot always be suggested and prescribed. Cotton, generally speaking, may be considered—and especially in all the warmer regions—as the most fit for the covering in proximity with the cutaneous surface. Clothing made from this substance is commonly agreeable and comfortable next the skin, and imbibes readily the moisture which is perspired; and it thus becomes peculiarly suitable in those climates where the cutaneous exhalation is proceeding so copiously. And thus, continuing the evaporation of the previously disengaged perspiration, the cotton clothing constitutes a convenient transferring intermedium. Linen, in similar circumstances, and especially in those unaccustomed, would be productive of unpleasant feelings; such as coolness or chilliness, either particularly or diffusedly experienced; or there may be the perception of irregularly refrigerating dampness.

XI. The moderns appear rather commonly to have restored the ancient custom of the Britons and Romans, &c. of employing woollen clothing in contiguity with the surface. The British have adopted, with increasing propensity, the method of their ancestors, amongst whom, for many ages, woollen garments were almost the exclusive articles of clothing. Considerable advantages are supposed to be derived from the continual employment of woollen garments, and more especially when worn immediately next the surface. These articles of clothing are now very commonly worn next the surface, and this is continued with unceasing obstinacy, whether the thermometer fluctuates about 32°, or casually advances to 70° or even 75°, which in this country it seldom surpasses. The woollen coverings become the convenient receptacles of the superficial excremental evacuations; and they are often allowed to continue, perhaps for weeks, or even months, saturated with animal excretions; and thus they are rendered the harbourage of abominable nastiness. A medical officer of the fleet has presented the following remarks upon this very subject, which is a circumstance of importance. "Only think of the condition of a seaman at hard labour, being drenched in perspiration with flannel next his skin: he has no wardrobe to shift himself, and if he does not shift he is no better than a walking stink-pot. It will be the same if he sleeps in bed with his flannel on: the practice is filthy and unwholesome. What consumes so much perfumery in the present day? it is the beau swaddled in flannel to cover the indelicate smell of his own atmosphere. If British seamen are to wear flannel next their skins, they are not subjects for a ship; they must soon lose the hardihood of constitution that fits them for their duty. Clothe them as warm as you please, but in the name of cleanliness give them linen or cotton next the skin.

XII. "The use of flannel next the skin has become a very general practice in phthisis; and the moment any person is phthisically disposed, he is immediately recommended to wrap himself in this kind of clothing. But this custom is certainly to be followed with some qualification. To preserve the body in an equal and grateful temperature must be very desirable in this disease; but it never could be intended to keep flannel so long in contact with the human body without shifting, as we daily see done. Those who wear it sleep with it on, and must very soon become offensive. It therefore ought never to be continued beyond a single night without a change; otherwise the body will be confined as it were in a bath of impure air, that ought to be exhaled instead of being accumulated. Very frequent ablution of the whole surface should be regularly attended to during the use of flannel.—But if the weakly and valetudinary have safely indulged in this practice, it never was meant that the young and healthy should have recourse to such effeminate modes of clothing.

The custom, however, has become so general, that we are in danger of losing the hardihood and vigour of our national character from its use. Flannel and fleecy hosiery are to be found under the shirt, among half of the young men of the age, whose habits of changing them are not more delicate than others I have mentioned.—After being much weakened by West India sickness, I had recourse to flannel next the skin; but in cold weather I now find more advantage by wearing it over the shirt, and think that I have fewer attacks of catarrh in variable weather from this, and the custom of general ablution. Although I was at one time a great advocate for flannel next the skin, I am now rather disposed to prefer wearing it over the linen, and to recommend daily ablution of the whole body, to inure it to the weather."

XIII. In particular complaints, or circumstances of indisposition, or modifications of constitutional healthiness, flannel or woollen clothing may occasionally be advantageous, and then their use is commendable. When they are judged to be necessary, they are more particularly adviseable in the latitudes which are obnoxious to the influence of varying weather, and more especially to the boisterous and unsettled seasons of those territories: seafaring people who are generally occupied in northern climates, may frequently employ woollen clothing, but, in this, even occasional exceptions seem not altogether inadmissible. The particular application of such advice, however, must be regulated by the requisition of individuals, and the discernment of those to whom the act of management more immediately appertains. Some may require the assistance of flannel in the colder months of the year, who can with propriety lay it aside for some time, continuing moderate and agreeable temperature. Amongst the healthful and vigorous, and certainly in the summer season, the uncleanly and improper custom of wearing flannel is not allowable. It introduces a necessity afterwards difficultly overcome and relinquished, and the practice should rather be discouraged: but, as may be understood from the nature of these short notices, the proposal is not to be considered as universally applicable; the wearing, or not wearing of flannel, must be determined conformably to the necessities of different constitutions.

XIV. Among all those who do not require to use flannel as their innermost artificial integument, cotton shirts will commonly be more convenient than those shirts prepared from any other substance. They are generally pleasant in contact with the surface; they harbour less foulness than woollen; and, from the readiness of displaying defilement, they, consequently, for the most part, are more frequently subjected to the necessary processes of cleansing, and these also are not so troublesome in the performance. A knowledge, established by attentive observation of the different articles of clothing, sufficiently confirmed the propriety of the preference generally given to the woollen and cotton as apparel to common sailors, in all their changeable circumstances. In the climates lying within the tropical boundaries, the cotton, as formerly observed, is the most proper; with occasional exceptions, arising from particularities of constitution, and those of some harbours, &c. in which the condition of the weather—and, on this account, that of temperature—is influenced and modified by the adjoining countries, islands, or the qualifications of the neighbourhood. In situations thus qualified, it is not unnecessary that valetudinarians should be provided against the impression of uncertain, and, sometimes, unexpected lowness of temperature. For, as previously noted, in some of these harbours, even although lying in regions reputed naturally and necessarily to be liable to the influence of high temperature, the transitions are sometimes important and suddenly introduced. The thermometer will sometimes, in the course of even a few hours, undergo a declension of 20°, 30°, or even more degrees; and these mutations thus produce a wonderful effect upon those who are unprovided against such occurrences. Vicissitudes of such magnitude require proportionate preventive measures, and most remarkably by those who have thus been immediately before exposed to augmented temperature. If some preventive or precautionary management is not judiciously and seasonably used, the consequences may be disagreeable. When these important depressions of temperature take place, an additional allowance of habiliments is, to all, both desireable and beneficial. The advantages to be got from a proper regulation of the clothing, in those naturally and frequently intervening mutations of the weather, &c. are remarkably exemplified in those careful and reflecting persons who are prudently prepared with the necessary supplies of comfortable investments, when compared with those worthless and miserable creatures who either have not been furnished with suitable clothing, or who may have squandered or exchanged it for something which is to them truly injurious. The considerate, and, therefore, ordinarily prepared, oftentimes prevent the occurrence of distempers; whereas those under the predominance of counterpoising circumstances, are the subjects of frequent disease; and when actually labouring under any particular complaint, their restoration is more troublesome, or not unfrequently impracticable.

XV. The clothing intended for mariners, in tropical climates, ought to consist chiefly of cotton, which to them, where the temperature ordinarily possesses such a comparative equability, will constitute the most agreeable and comfortable. The improper or untimely use of woollen garments, so commonly prevailing in merchant vessels, in which there are scarcely any beneficial regulations, even in these latitudes, is particularly objectionable, and, what is worse, often prejudicial, and should certainly be discountenanced. Notwithstanding the unqualified commendation this mode of clothing may have received, it is, however, accompanied with its inconveniencies, and occasionally succeeded by mischievous consequences. But an exploration of these would demand a more inquisitive examination than is, in this place, either apparently necessary, or conveniently admissible. It may be concisely and cursorily intimated, that woollen garments are unsuitable in particular constitutions and circumstances, for the following reasons: They retain and accumulate an additional proportion of caloric; for they are known to conduct caloric tardily, and thus become the most suitable coverings in low temperature: by which retardation of the avolation of the heat extricated at the surface, they become peculiarly irksome to the cutaneous surface. They likeways promote and augment still farther the universally and copiously increased cuticular exudation, and thereby the langour, weakness, listlessness, &c. and also slowness of the necessary revolutions of the intestines, so naturally and hurtfully happening in these climates, is encouraged and aggravated. Another consequential inconvenience is, that they are commonly not so frequently exposed to the operations of purification as might be commendable. And they are thus surcharged, or, if the expression be allowable, become saturated with animal exudations, till they become incapable of absorbing an additional proportion, and are thus exceedingly offensive and injurious to the wearer, and certainly disgusting to the spectator. Their absorbing and conveying properties, being thus diminished or destroyed, the following quantities of cuticular discharge are not transmitted from the surface, excepting it were altogether uncovered, and therefore continue in apposition: or, if the surface is not evidently perspiring, then the garments retaining the previously collected defilement, by their nearness to the surface, must induce considerable uneasiness, and not uncommonly cutaneous irritations, eruptions, &c. of different descriptions. These different cuticular affections are sometimes productive of considerable annoyance and uneasiness, not only in the tropical, but even in those customarily denominated the temperate latitudes.

XVI. The Chinese method of imposing and deposing their coverings, according to the decrease or increase of temperature, seems reasonable, considerate, and remarkably beneficial, and not unworthy of imitation and adoption by Europeans, when sojourning or become residents in foreign climates. From this mode of managing their clothing, they would obtain great benefit, and if their quantities of garments were thus suited to the nature of circumstances, it might be preventative of numberless inconvenient, and, occasionally, disagreeable consequences. It would be a commendable improvement, if seamen, in variable weather or climates, &c. employed a method of protection somewhat similar, which could be accomplished by an approaching conformity in the fabrication and adaptation of their habiliments. In some situations in the tropical climates, clothes formed of cotton or nankeen, which is made from the same substance, might suffice; and the number of folds might be increased, according to the diminution of temperature, and they could be decreased in proportion to its augmentation. Some might, perhaps, require the assistance of flannel or woollen coverings, in a similitude of circumstances. In the variable regions, or their colder seasons, clothes made of wool, and these in quantities adequate to the necessities of individuals, should be commended. The applicable management and proportioning of clothing, if in common life it be of such weighty moment, is, if possible, of more extensive and indispensable importance amongst the seafaring, in all regions and climates in which they may be subjected in the continuance of navigation. Every patriot, every man influenced by the common principles of humanity, must feel interested in the preservation of the health of soldiers and sailors, who constitute the principal animated machinery in the protection of their native country, and in the maintenance of its commercial undertakings. Some additional observations upon this subject will be introduced when the third subdivision of this department comes under examination, suggesting some instructions to travellers, adventives, &c. in tropical latitudes.

XVII. As an indefineable and inexplicable approximation to dissimilitude of countenance universally predominates, so, also, an incalculable, and often unaccountable discrepancy of constitutional circumstances and susceptibilities, are remarkable. The positive quantity of any particular article which may be agreeable to, or sufficient for one person, will not improbably be inadequate for the purposes of another. Some, regulated by the influence of capricious fashion or customary formality, which is frequently confirmed into habitude, and thus thoroughly established by the indeterminate or unmeaning insinuations of friendship, and also the conceivable advantages thus obtainable, wear flannel as their immediate artificial integument, even in latitudes subjected to the most powerful insolation. Others, again, instead of this lumbersome quantity of clothing, seldom or never use woollen coverings next their surfaces; and who, from a hardiness of constitution, withstand all changes of seasons with a comparatively diminutive proportion of habiliments. The proportion of clothing must doubtlessly be regulated by the particular necessities of individuals; but, as lately hinted, some persons acquire the habit of using a larger quantity than what seems to be requisite. But this is erring on the safe side: the greatest number suffer from an insufficiency of habiliments. And calamities arising from this cause are very common amongst the heedless seafaring.

XVIII. The wearing of woollen clothing has been considered necessary, and even beneficial, for different complaints, but especially in those of the pulmonary contexture. Whatever mode of appareling may be natural or useful in northern and variable climates, cannot consistently be perpetually applicable to districts possessing opposite physical properties. In the warmest countries it may, generally speaking, be pronounced an offensive, uncleanly, and often an injurious practice; and the application of the clothing in general, therefore, seems to demand more attention than it receives, or is generally conferred on a subject so deeply interesting. The impropriety and inconveniencies of woollen next the body, is often exemplified in those persons in trading vessels, who are so commonly ill supplied with suitable garments, and obliged to wear those rough heavy articles, when the lightest and smoothest are so particularly commendable. The integument in contiguity with the surface, is, from the artificially augmented perspiration, speedily and largely impregnated with this superfluous recremental evacuation; and, as already mentioned, diversified descriptions of cutaneous eruptions are produced, the person becomes proportionally debilitated, &c. and several other misfortunes occur, as have been introduced in various parts of these desultory observations before-mentioned.

XIX. Occasional exceptions, in a higher or lower degree, to these commonly applicable observations, may happen; and if such do intervene, they must be managed in proportion to the necessities of individuals. In particular states of constitution, then, flannel may be adviseable, whenever the thermometer descends below 65° or 60°, while, in the majority of constitutions, the cotton garments next the surface will be sufficient. But in general, if the cotton cloth is worn next the surface, the woollen on the outside of this may be adequate. Two principal considerations or circumstances may form rules for assisting in the commendable management of the clothing: the natural habits and necessities of individuals, and also those which may be accidentally superinduced. Convalescents will sometimes, even in the same degree of temperature, require more clothing than in their ordinary health. From want of the suitable quantities of garments, the seafaring, when debilitated or recovering from illnesses, often suffer not only a retardation in their amendment, but they frequently incur the probability of a renewal of their complaints. If they had been provided with the requisite quantities of clothing, their restoration would have been accelerated, or what is of still higher moment, the lives of many might have been preserved. Reliance cannot, with any propriety, be placed upon the discretion of sailors, as has been repeatedly hinted; they often need fostering care, and a fatherly guidance, and protective assistance. But from the general drift of these remarks upon the clothing of the careless seaman, it is unnecessary here to enlarge particularly.

xx. Blue is the common colour among seamen, and this is so completely and obstinately established, that it may be considered as one of their adventitious characters. This appears a matter of trifling import, as the darker colours are to be in general preferred; but the whitish or grayish, &c. may sometimes be conveniently applicable. It is almost needless to suggest any particular information or instruction about the formation of the respective articles of wearing apparel designed for seamen. These people generally have a peculiarity in the appearance of their clothing; so that, when Jack is dressed in his regular garments, he is expeditely cognoscible. The curtailed jacket, and the trousers or pantaloons, are perhaps the most convenient; and with these they should always use stockings; and those made of cotton will suffice in the warmer climates, and the summer season of the temperate latitudes. The defending of the feet and legs, in merchantmen particularly, is serviceable, where the men so frequently, from the confused and lumbered state of such vessels, are liable to bruises, scratches, punctures, &c. which in the beginning may appear trifling, but which, from the particularity of circumstances, often prove tedious and painful. The shoes intended for sailors and soldiers, should be always wide before, so that the feet may not be pinched, confined, or straitened. This wideness of the anterior extremities of their shoes should never be exchanged nor superseded. Agreeably to this method, the feet, and especially the toes, would be permitted gently to expand, and in some measure accommodate themselves in the various situations, postures, &c. in which the seaman must be employed in mounting, descending, and revolving himself amongst the rigging, which would thus be of particular advantage. The natives of those regions who live in a state of natural freedom, and whose feet have not been restrained, and in some measure crippled, have a conveniency, adroitness, and readiness in scrambling, &c. which are never so observeable amongst Europeans. The feet of the former have never been unnaturally constrained, straitened, or aggregated and disfigured, as is so common amongst the latter, whose feet, and especially the toes, have been affected by unreasonable confinement. The barbarian has the greatest facility in the divergency, or expansion and flexibility of his toes, their adaptation to particular and irregular surfaces, and in his wonderful promptitude in grasping and retaining the different objects of support. The European's toes are sometimes so huddled and entangled, by the practice of wearing tight shoes, that, like a Chinese female's, they have almost lost their natural and useful mobility, and sometimes reduced to nearly a state of immoveable aggregation; and thus his climbing commonly acquires proportionate slowness and insecurity. His hands, then, unluckily for his usefulness, are the mechanism upon which he places his principal dependance. These hints and notes, to the irrational and uninformed, may perhaps appear extremely frivolous, and unworthy of attention; but in opposition to such ungenerous and inaccurate conclusions, they are here deemed to be deserving of particular consideration, not when theoretically, but especially when practically contemplated.

XXI. The covering for the head, in the warmest climates, is a subject of principal importance, but commonly not properly attended to and regulated. The inhabitants of temperate, when emigrating into intemperate latitudes, cannot be too attentive to the appropriate management of their headdresses. This is one of the indispensable considerations in the endeavours determinable to their preservation; and, by inattention to this circumstance, many prejudicial consequences are thus imperceptibly superinduced. All that the person, perhaps, experienced or remembers as apparently more immediately originating from this incautious and imprudent exposure, may have been headache, not very remarkable; or dizziness; some listlessness, with transitory sickness at stomach; or faintness: but these are, very often afterwards, when the day of account arrives, altogether overlooked or disregarded. A frequent repetition or continuance of the exposure, is ultimately succeeded by symptoms, which, both to sufferer and attendant, communicate the idea of importance. Different modifications of disease of the brain are thus slowly but surely produced; and sometimes displaying themselves long after the cause has ceased to operate; and, therefore, in common observation and treatment, the origin of the mischief is probably altogether unsuspected: Sed quanquam "causa latet vis est notissima." But the diffuse examination of these circumstances would lead into the history of the causes of disease and its phænomena, which, in this place, how reluctantly soever overpassed, would be inconsistent. The most remarkable, and the most important circumstances only, can be brought into view, and thus stand as conspicuous suggestions for the regulation and assistance of more particular and expansive investigators. By a complete or comprehensive examination of all the circumstances influencing the preservation of healthiness, or the production of distempers, every paragraph might be diffused into a treatise, and thus the undertaking would be almost interminable, and its copiousness become immeasureable. The generally operating and prevailing principles once agreeably understood, the applicable management, proportionally to the predominance of circumstances, may conveniently be comprehended and practically superintended.

XXII. The common straw or willow hat appears a very suitable and convenient umbraculum in these regions, and it should have, for defensive purposes, a sufficient proportion of broadness. A precaution eminently adviseable, is, to combine lightness with an adequate degree of protection from the hurtful influence of insolation. By an agreeable conjunction of these properties, considerable advantages are obtainable. The protection of the head from the sun's heat, and the eyes from the immediate admission of his rays, are considerations of remarkable importance. Headache, if produced by common exposure, may, in some measure, be mitigated; or, if seasonably employed, prevented, by inserting in the crown of the hat a moistened cloth or handkerchief. And hence, from these abbreviated observations, the great impropriety and inconvenience of using the heavy black hats which are commonly used in Britain, when the natives pass into tropical latitudes, may, in some measure, be comprehended. The exotical residents of the warmer climates frequently employ this kind of covering for the head, even in the highest degrees of temperature to which they may be exposed; even as high as 120° of Fahrenheit's thermometer. Those, likeways, who are recently imported, often suffer from this misconduct; and also from using the heavy cloth coats, &c. which would be more suitable as defensive habiliments in the colder seasons of their own countries. In this manner, several after their arrival, even in the warmest climates, go on visiting and feasting, and drinking furiously; and, from the sudden changes induced in their systems, become speedily the subjects of violent diseases, whereby they are disabled; or, as frequently happens, they are soon numbered with the dead! A vigorous and healthful youth of seventeen or eighteen has been known, by irregular exposure to powerful insolation and other unfavourable circumstances, to be destroyed in less than three weeks after his arrival in a hot country; sometimes a few days have been sufficient for the purpose.

XXIII. The aboriginal inhabitants of tropical climates use sundry methods and articles for covering the head, as those who have visited these scorching regions may have ascertained through the assistance of painful observation. The turban assumes a diversity of figures amongst the Indian nations, conformably to particularly predominating circumstances. This difference is so expressively or remarkably characteristic, that, amongst them, the figuration of the turban frequently constitutes the representative of specifical distinction or discrimination. A comparison of the Hindû, Gentû, the Parsee, the Arabian, and a native of Toorki, will bear sufficient testimony to the correctness of this declaration. The bandages or swathes with which they so carefully encircle, and frequently enwrap their heads, to Europeans, unaccustomed to such couverchiefs, would be cumbersome and unpleasant. And, moreover, they do not afford that shadowing protection to the countenance which may be considered as so adviseable and defensive. Although, at first sight, these might seem allowable conclusions with respect to the eastern headdresses, yet, upon more particular consideration, the advantages and mode of operation of these couverchiefs do not appear altogether inexplicable. They may, in two ways, be concurrently serviceable: they constitute intermedia which conduct caloric slowly; they are at same time not impervious to moisture, and, consequently, that natural exhalation constantly proceeding from the head, and especially in the warmer climates, will be absorbed and continually transmitted. The chief point of refrigeration in these covers will, in all probability, be at some distance from their external surface; and, in this manner, the head will be equally cooled, and at same time, unless in extraordinary circumstances, it will never be overheated. The continual employment of the turban, however, does not appear to be without its inconveniencies; for, occasionally, in those past mid age, some degree of impression is observeable, at least in the integuments of the head, and especially in the course where the turban has pressed most pointedly. If the head should not be in a perspiring condition, it is probable that the heat will be aggravated with the feelings of additional uneasiness. It sometimes happens, also, when they have been much exposed, or employing more exercise than ordinary—and, consequently, perspiration flowing copiously—that when they get under coverture the turbans are removed, and thus, by the evaporation from the head, they experience an agreeable coolness.

XXIV. The coverings employed by the Chinese vulgar, and especially when exposed to the sun and weather, are perhaps preferable to those more generally used by the natives of hot countries. These coverings, employed for defending the head, are the broad-brimmed bamboo hats; but they would not be so convenient to the European seafaring. It is almost unnecessary to observe, that, in the variable latitudes, sailors should be provided with hats capable of resisting the entrance of moisture. In the colder seasons the hats may be of a dark colour, but, in the warmer, the lighter coloured: such as whitish, grayish, &c. should be preferred. The hats may be so framed as to be both light and durable. The trousers should be gently fastened around the ancles; but this would constitute an innovation, and, on this account, is probably not admissible. The different forms of the sailor are not to be subjected, perhaps, to any alteration; but, like a Roman orator's gown, must continue in possession of inviolable and unalterable peculiarities. Seamen in the tropical latitudes, generally, only require the cotton or nankeen trousers; for these, in the temperature of 75° or upwards, will be in the healthful perfectly sufficient; and, if an additional quantity is worn, it will only be burdensome and the cause of uneasiness. A difference of management will be occasionally allowable and beneficial to the unhealthy, and to those who are sometimes liable to affections of the intestines, accompanied with augmented inclination to evacuation, and especially when they may be obnoxious to irregular exposure in fluctuating diminutions of temperature. But here the common sailors are subjected to an inconvenience which in these circumstances they often cannot amend; they must either use the lightest clothing which they have got, or the common woollen becomes the alternative in application. If they were provided, as already proposed, with different articles of the finer kinds of clothes, then they could proportion their quantities to more advantage. Sailors, it would seem, should be supplied with clothes of different fineness, so that they could vary them conformably to the inequalities and alterations of temperature.

XXV. The Chinese prepare a cotton cloth having one of its surfaces rough, but agreeable in contiguity with the body, and which would form a very convenient covering next the surface when the weather is changeable. Cloth of this description might be prepared in any proportion necessary in Britain, &c. and would, undoubtedly, constitute a very agreeable and beneficial integument, both amongst sailors and soldiers, in the variable and coldest months of the intemperate latitudes; and would, in many instances, form an acceptable substitute to flannel, which is so commonly commended. This substance appears more cleanly than the latter, for reasons formerly suggested; it retains caloric or heat in nearly an equal degree, and also makes an agreeable intermedium for the absorption and transmission of the matter of perspiration; and continuing the vaporation from the surface, is a preventative of the unpleasant chilliness occasionally perceptible in intervening or interposed quiescence. This is a circumstance implicating an amplitude of disquisition, but here a few occasional suggestions only are admissible. In these circumstances, and scarcely in any place more commonly than in many situations of the tropical latitudes, the human body is peculiarly predisposed to the occurrency of complaint, and also to the reproduction of distempers which were previously considered as completely exterminated. Many of the most dangerous diseases are thus too often carelessly engendered, and thoughtless or imprudent convalescents have a troublesome renewal of their respective complaints. These mischiefs may happen in any climate; but, in the warmer, the provision against occasional diminutions of temperature are seldom so sufficient as in the colder latitudes. Such occurrences, with their consequences, may be expeditely understood from the explanations upon the atmosphere, with its temperature in its changeable fluctuations, and influence upon the human constitution. Imprudent exposure, too, is perhaps more common in the warmer regions, from the custom of going more lightly clothed; the imprudent sailor, from a slight change in the heat, does not judge it necessary to institute a proportional alteration in the quantity of his habiliments. By careless exposure to the aerial current of a port-hole, for instance, and especially if the person has been previously and copiously perspiring, he will sometimes become the subject of disease; and, although the cause is thus sometimes not difficultly assignable, yet, often so great is the grossness of conception of these men, that this very distinguishable circumstance is either misunderstood or misinterpreted. By inattention in the night, during sleep, and exposition to the influence of a scuttle or gun-port, when there is a cool traversing breeze, disorders of different descriptions are frequently produced; headache, cynanche, catarrhal and febrile affections, &c. are a few of these accidental consequences. Some notifications upon such circumstances were already communicated, so that there seems to be here no need of further animadversion.

XXVI. The foresaid kind of cotton clothing would be extremely suitable in the variable latitudes, or in the winter season, to such as required such additional protection. The cotton clothing is certainly the most agreeable and convenient in the augmented warmth so commonly distressing in the tropical climates. This cloth might be fabricated of different degrees of fineness, and it might, likeways, receive a variety of colouring, in conformity to the desire of the wearer, or the nature of circumstances. In India it would be possible to have a cloth of this description, so contrived as to be made of silk and cotton; the former of these to appear on the outermost surface, and the latter on the inner, and so raised as to be rough and downy, which might be used in variable weather, or in the coolness of the night, by those in higher station. Some, again, who may be of delicate constitution, and who probably have confidence in flannel or woollen clothes, may perhaps employ such coverings, when, from the nature of the weather, or their exposure, such defensive teguments may be deemed necessary. It would appear that the preceding remarks are considered not as absolutely dogmatical, and applicable without any discrimination or discretionary superintendance: reasonable conclusions must point out a consistency in the employment of these suggestions, observations, &c. and then their usefulness will be proportionally appreciated. When sailors, therefore, are to be employed in the tropical latitudes, they should be suitably provided with clothes for their particular kind of exposure; and from this it may easily be understood, that the same quantity, even in these scorching climates, will not be invariably or continually applicable; but the propriety and times of varying the quantities of dress may be drawn from the disquisitions on the atmosphere.

XXVII. The colour of the clothing, which was formerly mentioned, is of considerable importance; and it was also insinuated, that frequently, in opposition to the rules of propriety, imitative formality sometimes regulates, and strangely maintains, a servilely conforming similarity. "Similem rarò natura præstat, frequenter imitatio." The lighter colours, however, as formerly declared, whatever the obduracy of imitation may dictate, are more convenient and suitable in the tropical climates, and may be employed in the warmer weather—summer for example—of most of the habitable countries. The natives of tropical countries, when they do use clothing, appear generally to employ whitish, or lightly coloured vestments; and this seems to be the practice amongst those especially who are in comparative convenience of circumstances, and who thus can maintain a tolerable share of cleanliness. Whether this predilection, and apparently ceremonious observance, may originate from a continually transmitted simplicity, or an acquisitive knowledge of the propriety and usefulness of using white habiliments, are suppositions which are not easily determinable. Some considerations and circumstances, it may here be observed, would seem to counterpoise some of the foregoing conclusions; and, if a comparison should be instituted, some difficulties would intervene, which, in the present condition of human science, scarcely admit of any satisfactory explanation. One circumstance which might introduce manifold reflections, is the darkness of the superficies of the natives of these climates, with its supposititious usefulness or disadvantage. This blackness (varying in degree,) may be considered as a natural tegument—a physical defensive property; it may, indeed, even among millions of human beings, be thus deemed their defensive integument, almost exclusively. The different gradations of coloration of the corporeal surface, observeable from 40° or 45° of northern, to the same degrees of southern latitudes, vary from the subpallid, lightish yellow, brownish, slightly perceptible, up to a deep shade of blackness. After this manner, in considering the physical properties of mankind, the old observation, "ater an albus sit homo," will form a part of scientific distinction. This superficial blackness, fluctuating through all its conceivable intensities and remissions, it is reasonable to suppose was not originally peculiar to any part of mankind; it is, not improbably, a superadded qualification.

XXVIII. Inquiry might be made, what particular purposes this colouring of the surface is supposed, or rather intended to answer? The darkness or lightness of the shade is perpetually fluctuating, conformably to the peculiarities of the different countries, of which the people partaking more or less of this blackness, may be the inhabitants. What a difference betwixt a native of Guinea and a Spaniard! and what a remarkable disproportion, in this circumstance, of the inhabitants of champaigns and mountains, comprehended between even the same parallelisms of latitude. Does this black colour arise from physical necessity, gradually operating, as constituted by the powerful influence of continued insolation upon their exposed surfaces? This superficial blackness or darkness of the natives of most of the tropical territories, should, conformably to the information imparted by chemical examination, of the action of caloric upon the surfaces of bodies variously coloured, be considered not to be beneficial, but rather detrimental: for it is known, for instance, that when substances are blackened, they are more heated by the rays of light, or rather heat, than when they are not so prepared. These circumstances, therefore, constitute difficulties not to be conveniently reconciled nor explained. This peculiarity of cuticular colouring does not, nevertheless, appear to be amongst them a consideration productive of any determinable inconvenience. Whether this seemingly indifferent capability of endurance be deriveable from principles introduced by habitual exposition, and thus strengthened by a constitutional modification, is apparently inexplicable. It is ascertained by travellers and foreigners, when inhabiting the scorching territories, that the colour of the clothing employed, and especially in the heat of the sun, is, however, a consideration of importance. The most incurious and inattentive who may expose themselves in these regions, must have perceived the difference produced by a black or white garment in like circumstances. No positively conclusive arguments are conveniently deducible from the comparison of black and white, when applied to the surface of the human body, to corroborate the advantages supposed to be got from the use of whitish clothing in the warmer climates. Observation and consequent experience introduce themselves, it may be observed, as constituting insuperable demonstration of its usefulness, and conclusive commendation of the suitableness of its application. Chemical experiments have shown sufficiently, that the darker the surface of any substance, it, on that account, receives and embodies a larger quantity of caloric; and the whiter the surface, the quantity absorbed and detained is the smaller.

XXIX. Caloric may either be radiated or absorbed at the surface of bodies, or these two operations may occur simultaneously. That heat was radiated from different surfaces, was ascertained as far back as 1682, by Mariotte, and mentioned in the Memoirs of the Academy of Sciences. It is stated, that "the heat of a fire, reflected by a burning mirror, is sensible in its focus; but if a glass be interposed between the mirror and the focus, the heat is no longer sensible." As far as known by the Author, no comparison has been instituted betwixt the radiation of heat from the surface of the human body and that of inanimate substances; but that some difference subsists is extremely probable. Neither has it been ascertained, whether more caloric may be absorbed at the surface of a living, or that of a dead or lifeless body, in the same circumstances. Experiments, however, have been made, upon the relative facility with which caloric moves through different substances, which are or may be used for clothing. Rumford, with the intention of determining the relative degrees of warmth of different articles used in clothing, performed experiments on the substances of which they are ordinarily composed. The method he employed was, to suspend a thermometer in a cylindrical glass tube, one extremity of which was globular, and 1$\frac{6}{10}$ inch in diameter; the bulb of the thermometer was placed in the centre of the globe. This contrivance was then surrounded with the substance; the instrument was then heated in boiling water, and, being plunged into a mixture of pounded ice and water, the times of cooling were observed. The number of seconds were noted, in which the thermometer cooled from 70° to 10° of Reaumur's instrument; and the following are the results. Air, 576″; raw silk, 1284″; wool, 1118″; cotton, 1046″; fine lint, 1032″; beaver's fur, 1296″; hare's fur, 1315″; eider down, 1305″. The relative conducting faculty of these substances being inversely as the time expended in cooling; hare's fur and eider down being the slowest conductors, and lint conducting most rapidly. Those which conduct or convey heat most slowly, would, therefore, constitute the most suitable materials for artificial coverings in low temperature. The Count's experiment was repeated with charcoal finely powdered, lamp black, and pure dry wood-ashes. The times of cooling with these, through the same distance of the thermometer, were—for the charcoal, 937″; the lamp black, 1171″; and the wood-ashes, 927″. It may be observed, that the conducting power of these substances is modifiable by their comparative state of condensation. And, consequently, when these matters are framed into cloth, and thus more condensed, caloric will pass through them with more readiness. Their capacity for forming convenient articles of clothing, will in some measure be determined by the quantity of air contained in their pores, and, chiefly on this account, the loose articles conduct heat more tardily; and from this the advantages of loose, shaggy, or downy clothing, will be explicable. Much will depend upon the state of the air, whether it is charged with moisture or otherways, and, particularly, whether in a state of agitation or stillness.

XXX. "When we wish to confine caloric, we avail ourselves of this difference in conducting power, and employ substances which are imperfect conductors. Thus furnaces are coated with a mixture of clay and sand, to prevent the dissipation of heat. To exclude caloric, or to prevent it from being communicated to a body from the surrounding medium, the same method must be employed—surrounding the body with an imperfect conducting substance: on this principle ice-houses are constructed." It is in this manner, also, that clothing becomes useful in the colder climates, by retaining, or rather slowly conveying, the heat from the surface of the body; and thus the natural temperature is not so swiftly dissipated. And in the warmer regions, clothing may be serviceable by the resistance which it thus gives to the accession of caloric to the surface, while refrigeration is proceeding by means of evaporation from the body, which is commonly such a conspicuous phænomenon in high temperature. The wideness or looseness of the clothing, as will be shortly explained hereafter, is therefore, in the scorching climates, a circumstance of importance; for while the wide easy garments thus intercept the direct influence of the solar rays, (or those which have been supposed to proceed from the sun, and have the effect of heating, and on that account styled the calorific rays,) the operation of evaporation, and consequently refrigeration, is allowed to go on at the surface, to the great relief of those in this unfavourable state of exposure. The influence of the different kinds of materials employed in clothing, will, likeways, have varying effects, agreeably to the state of weather; and, for instance, the same garments will be relatively warmer in clear sunny weather, than when it is cloudy or obscure. A black coat will radiate most caloric in sunshine, but may have a different effect in duskiness or obscureness of the atmosphere. And with regard to those who may be exposed in the night season, it may be observed, that it is frequently, or rather commonly, cooler at the surface of the earth, when the sky is cloudless, than when the person seems defended by a cloudy canopy. And hence, those who are unavoidably exposed in the night, may obtain considerable advantage by having a cloth, or other kind of defence, expanded over their heads, but at no great distance. From this, also, the benefit of awnings in ships and boats may be explained, and the use of these not only in the heat of the day, but also in the nocturnal coolness.

XXXI. "From the difference among bodies in their power of conducting caloric, arise the differences in the sensations of heat and cold, which they excite when applied to our organs, though the thermometer shows that they are at the same temperature. The sensation of cold is produced by whatever abstracts caloric from the part to which it has been applied; and of two bodies at the same temperature, the one which is the best conductor of caloric, will abstract it most rapidly, and therefore occasion a more intense sensation of cold. The sensation of heat is produced when caloric is communicated to the sentient part; that body which is the best conductor, will communicate a larger quantity in a given time, and therefore, when applied hot, will excite a greater sensation of heat than another will do at the same temperature which is a less perfect conductor. Hence, a piece of metal, at a low temperature, feels colder than a piece of wood, though their temperatures are proved to be the same by the thermometer; and, on the contrary, it will at a high temperature feel hotter than the other."—From these remarks it is understood, that different substances impart, to a sentient portion of the body, an unequal degree of warmth, or convey the notion of the presence of an unequal degree of heat, even although they should all manifest an apparent equality or sameness of temperature, as determinable by the thermometer. This difference of perceptible temperature is of consequence, when applied to different articles of clothing. Those bodies which give the sensation of a less degree of heat, even although they are of the same temperature when measured by the thermometer, produce this effect, by being what have been called better conductors of caloric; and, consequently, by absorbing and conveying away the heat of the corporeal surface faster than other bodies, cause the sensation of greater cold, even in apparently an uniformity of accompanying circumstances. In this manner, by having articles of dress of different conducting powers, various parts of the body might have the sensation of different proportions of temperature.

XXXII It is also not improbable, that the surface of the human body will, in some measure, be determined, in its absorbing and radiating powers, in conformity to the variegation of its coloration. If the black surface radiates most caloric, it is perhaps reasonable to conclude, that this operates beneficially in the warmer climates, by moderating the otherways insufferable temperature. In the hotter weather even of Britain, many persons who are exposed to insolation assume a brownish yellow shade, and especially in those parts of the body which are more commonly unprotected. This alteration in the surface of the human body, in the tropical latitudes, where it sometimes approaches the shade of the mulatto, and very commonly as high a tinge as that of the quadroon or quarteron of the West Indians, is sometimes peculiarly observeable. That this artificial colouring arises from the operation of insolation, seems confirmed from this—that it occurs in those only who are exposed to the solar influence, while many, who generally continue under coverture, often have a shade of unnatural paleness. This circumstance does not apply exclusively to the adventitious inhabitants of these warm climes; it is commonly exemplified amongst those who may be reputed, or actually are natives, and perhaps in no country so distinctly as in the Chinese; for among them, those who are generally employed or loitering under the shade, often have a deadly paleness of surface, while those, again, who are in unrestrained exposition, present various shades of browmness. This artificially produced infuscation of surface must answer some useful purpose; and, if it is serviceable in radiating more caloric, the advantage consequential to this alteration will be proportionate to the superficial discoloration. Notwithstanding these remarks, a difficulty still attends any attempt at explaining the beginning of the dark colour of one part of mankind, and whether it was originally stamped upon them, or subsequently and progressively superinduced. It is also further to be observed, in reference to this subject, that the colour of the human race, even in those countries where the inhabitants are commonly reckoned blackamoors, admits of varying shades, from that of the withered leaf of autumn, up to a high shade of blackness. The diversified natives of Asia represent these varieties most remarkably; and whether this diversity may originate from fortuitously procreative intermixture, or from individual constitutional qualification, is not conveniently determinable. The Parsees and Armenians are examples of the lightest coloured people, some Europeans excepted, who inhabit the more southern Indian territories; but these, also, may be considered adventives. It is, perhaps, a question not yet properly answered—whether the descendants of persons originally white, but who were affected by the influence of warm climates, may gradually assume a darker tinge, till they equal the colour of the natives. The degenerated and despicable Portuguese, who constitute an adulterated part of the population of Asia, have a darker colour than many of the native inhabitants.

XXXIII. The colouring of the surface, however, (most probably seated in the matted texture placed under the true skin,) is an important consideration, not only in the natural history of mankind, but also with reference to its influence upon their comparative longevity, and particularly, in this place, in respect of the most suitable mode of clothing, and the general principles applicable to the preservation of healthiness. There must be some difference, as lately hinted, betwixt radiations from an animated surface, and that of a body which is inanimate: and this will, in all probability, be modified by the peculiar state of the surface at the time; as, for instance, whether it be in a state of perspiration, or in that of dryness. It is not unlikely, or rather it is probable, that the perspiring surface will radiate less caloric than when in an opposite condition. And the reason of this plausible supposition, may be explained from what was formerly advanced on the subject, in the investigations on the atmosphere; the quantity of caloric embodied and carried off in the matter of perspiration, will be sufficient to counteract any immediate ill effects from an abundance of either the animal heat, or of that communicated from the atmosphere, or even from these two circumstances in combination. The unctuous or oily substances, with which the natives of the hot regions so commonly besmear their surfaces, may be beneficial to them, by removing the point of most effectual radiation to some distance from their surface. It may be farther serviceable, from the slowness of its evaporation, and continual absorption and avolation of the matter of heat, or caloric, embodying with it, and thus, in some measure, operate vicariously to perspiration. By its influence in this manner, it may lessen materially the uneasiness which might otherways be excited on the surface, and, by acting as a substitute for perspiration, it must be advantageous in the maintenance of the constitution. In the second chapter, the benefits which might arise from keeping the surface constantly moistened, were mentioned, and as Europeans will hardly condescend to daub their surfaces with greasy matters, after the manner of the Indians, &c. the moistening of the surface with some aqueous fluid, and the management of their clothing, will, therefore, with them, ordinarily constitute considerations not of trifling importance. The use of oil, as applied to the human body, is of high antiquity. The first mention of the use of oil, is that contained in the Holy Scriptures; and then it was commonly applied at the consecration of the priesthood, and at installations into kingly authority: it was therefore styled the "holy anointing oil," when applied to such purposes. The use of oily compositions seems to have passed to the Greeks, even perhaps long before the Trojan war; for the outward use of oily matters is mentioned by Homer. He represents Juno as anointing her body with perfumed oil, before she adorned herself to fascinate the mind of her husband.

> ....αλειψατο δε λὶπ᾽ ἐλαίῳ
> Αμβροσιῷ ἐδανῷ, το ρα οἱ τεθυωμένον ηεν.

Oil, also, was employed in the athletic exercises, and for the relief or cure of diseases; so that the external application of oil, for the medication of diseases, became a separate and distinct part of medicine, and denominated Iatraliptic Medicine.

XXXIV. On the subject of unctuous substances, as applied by the Eastern nations, Mr. Hunter makes the following remarks: "As our present business is with the use of unction among Asiatics, it is desirable to know the opinion of their own physicians on its effects. A compendium of this is contained in the following translation of a passage which I received in manuscript from a Mussulman doctor. I regret that I did not at the time inquire from whence it was taken, which I have not since been able to ascertain. ‘ The practice of inunction in the bath is attended with several advantages. In the *first* place, although the bath is of itself moist, yet, because of its promoting perspiration, and thus dissipating moisture, it may become a cause of dryness. But the oil entering the pores, prevents this effect, and confers moisture and softness.’ ” And it is subjoined in a note, that “ Dr. Mitchell says, that oil, applied to the skin by friction, is useful when the oily effusion from the exhalant vessels of the skin is too sparingly supplied, or too quickly removed, in consequence of which, the epidermis is apt to become horny, to crack, and to induce disagreeable or painful sensation. *Secondly*, in consequence of profuse perspiration, certain matters are drawn outwards, and, in passing through the pores, irritate the skin; whence we see eruptions of pimples (prickly heat) in the hot season: now the oil, by its unctuous quality, softens the pores, and guards them from injury.” And Hunter adds in a note: “ A medical friend informs me, that one hot season he was in the daily habit of cold bathing, and his body was covered with prickly heat to such a degree as to be almost intolerable. At length it occurred to him, that by rubbing himself with pease-meal, or *besun*, which had been his constant practice while bathing, the skin was deprived of its unctuous defence, and so more affected by the acrid matter of perspiration. He immediately desisted from such frequent use of besun, that is, instead of once, and sometimes twice a day, he applied it only twice a week, but continued the cold bath in all other respects as before; the prickly heat disappeared, and gave him no farther trouble. *Thirdly*, it cannot be doubted, that during the great inanition which takes place while sweating in the bath, part even of the radical moisture of the body is expelled: but the oil which enters the pores retains the radical moisture in its place. Farther, the physicians of that country (probably Greece or Arabia,) chiefly use the oil of olives, which prevents the accumulation of morbific matter. Besides, the bath is often used in diseases of the skin proceeding from dryness. The oil, besides correcting this defect, confers a softness on the skin. *Lastly*, the skin becomes hard from any obstruction of the pores, and oil removes that hardness."

XXXV. "The Hindoo physicians repose great confidence in the use of oily friction. In answer to my inquiries on this subject, Mr. Boyd, whose knowledge of the Sanskrit language has enabled him to search deeply into their medical records, favoured me with some extracts from the Sushurt, a very old book, and of high authority among the Burhumuns, in which is enumerated a variety of oils and unctuous substances, both from the vegetable and animal kingdoms. The articles of both kinds are no less than seventy-six in number. Among the most distinguished are clarified butter from the cream or milk of various animals, and the oil of Sesamum.—The principal virtues for which their use, by way of inunction, is commended, are giving softness and sleekness to the skin, flexibility to the limbs, and stability to the body in general; increasing the secretion of fat and of the seminal fluid; prolonging life; curing madness, fever, œdema, cutaneous diseases, and worms; allaying lancinating pains of the abdomen, and those from bruises, in whatever part; curing the bites of wild animals, and even of serpents."—The following are Mr. Hunter's conclusions, in more immediate reference to the subject under consideration: "From what has been said, we may draw the following conclusions. 1. That the application of oils, and other unctuous substances to the skin, serves to guard the body against the inclemency of the weather, particularly cold and moisture.—Dr. Sparman says, the ointment of soot and grease, with which the Hottentots smear their bodies, defends them so much from the action of the air, that they require very few clothes. And Dr. Currie, with a similar intention, recommends the use of inunction to Europeans in warm climates, especially after bathing, to defend the body from the chilling effect of evaporation." And here the following quotation is taken from Lord Verulam: "Inunctio ex oleo, et hyeme confert ad sanitatem, per exclusionem frigoris, et æstate ad detinendos spiritus, et prohibendam exolutionem eorum, et arcendam vim aeris, quæ tunc maxime est prædatoria. Ante omnia igitur usum olei, vel olivarum vel amygdali dulcis, ad cutim ab extra unguendam, ad longævitatem conducere existimamus." "He," (Currie,) "adduces the example of savage nations, who compensate in this way for the defect of clothing; and observes, that the ancients were accustomed to anoint their bodies, before the exercise of swimming, to mitigate the shock of immersion.—Ter uncti Transnanto Tiberim, somno quibus est opus alto.—In the moist climate of Bengal, the practice of inunction is more frequent than in the northern and western parts of Hindoostan, where the air is drier. 2. It may prevent too profuse perspiration in hot weather, which is one cause of debility. It seems to be with this view that Hippocrates, in a passage quoted above, recommends, in summer, the wearing of clothes imbued with oil; and we see that the Asiatic physicians entertain the same idea. Murray is of the same opinion. Dr. Cullen says there is no just foundation for this; but the only argument which he produces against it, viz. 'the general practice of the ancients, as well as the Asiatics in modern times,' may only prove that a diminution of perspiration, which, though perhaps very considerable, will be compensated by other secretions, is attended with no bad effects on the system. Dr. Currie says, that unguents of a proper consistence may retard excessive sweating, yet not obstruct moderate and necessary perspiration; and, being themselves evaporable, they may keep up a coolness that shall diminish the necessity of the natural discharge. The real state of the fact can only be ascertained by statical experiments."

XXXVI. Much remains to be determined on a subject of such importance, not only to the inhabitants of the colder territories, but also to those naturally subjected to the strongest influence of insolation. A natural instinct must have prompted mankind, in various places of the world, to modify their coverings, and even their own surfaces by different applications. But what the precise benefits are, which may redound from these modifications of superficial applications, is not sufficiently comprehended: this conclusion, however, applies more especially to inunction, &c. of the surface. The nature and operation of common clothing can be in some measure conceived and explained; and not only the qualities or natural properties of the substances used for covering should be taken into consideration, but even their artificial colouring, which would seem sometimes to be of consequence. The following experimental conclusions, on the effects of colour in the radiation of caloric, may serve so far in explaining some of these circumstances. It has been already remarked, that when bodies are blackened, they are more heated by the rays of light than when not thus coloured. "From the experiments of Scheele, in which he blackened the metallic mirror placed before a fire, and found it was more heated than when clean;—it appeared to be the same with regard to radiant caloric;—and this was farther ascertained by Pictet. When the bulb of the thermometer, which, by the caloric radiated from the matrass of boiling water, was raised from 47° to $50\frac{8}{10}^\circ$, was blackened, it rose, the experiment being in every other respect the same, from $51\frac{8}{10}^\circ$ to $55\frac{8}{10}^\circ$. From Scheele's experiments might be collected, though with some obscurity, the effect of different kinds of matter at the same temperature in radiating caloric. Experiments of a similar nature, though likewise obscure as to their rationale at that time, were made by Pictet, by interposing a glass mirror, or plate, covered with amalgam on one side, between the hot body and the thermometer, and according as the glass, or the metallic surface was opposed to the hot body, or according as either surface was blackened, the calorific effect on the thermometer was different. With regard to the law which is observed in the discharge of radiant heat, in relation to temperature, Delaroche inferred from a number of experiments, that the quantity discharged is not merely proportional to the excess of the temperature of the hot body above the surrounding air, but that it increases in a much higher ratio."

XXXVII. "I have," continues Dr. Murray, "to give an abstract of the experiments of Mr. Leslie, which discovered some other facts with regard to radiant heat, particularly the relation of different surfaces in emitting the calorific rays. He employed a single reflecting mirror of tinned iron, placed upright in a wooden frame. As the substance radiating caloric, he used small hollow cubes of tin, from three to ten inches, which were filled with hot water, and placed before the mirror at the distance of a few feet; by covering or preparing the sides of the cube in various ways, he could ascertain the effect of different kinds of matter on the radiation; and to ascertain the effect with more accuracy, at a temperature thus not very highly elevated, he employed the differential thermometer. The tin vessel being filled with boiling water and placed before the reflector, a few feet distant, and one of the bulbs of the thermometer being placed in the focus of the mirror, a rise of temperature is immediately indicated. To examine the effect of different substances in radiating caloric, Mr. Leslie painted one side of the vessel (a six inch cube) with lamp-black, coated another with writing paper, covered the third with a pane of glass, and left the fourth uncovered. The vessel being filled with boiling water, and the black side being opposed to the reflector, the liquor in the thermometer rose 100 degrees of its scale; the prepared side caused a rise of 98 degrees; the glass surface 90 degrees; and the metallic surface not more than 12°. These numbers, therefore, express the different powers of these surfaces in radiating caloric, as in all the experiments the effect was different, though the temperature of each surface must have been the same. The power of bodies to radiate caloric, and that to reflect it, are opposed to each other. A blackened surface radiates most, glass next to it, and a polished metal least; while in the power of reflecting, the order is the reverse, the metal surface reflecting most copiously, the blackened surface least. The radiating and absorbing powers appear to be proportional, the vitreous or blackened surface absorbing radiant heat much more perfectly than the metallic one, and are inversely as the reflecting power." This doctrine, it may here be observed, is not only of importance in reference to the surface of articles used for investments, but is of considerable importance in the different processes of cookery. Even in the making of the common beverage styled Tea, the colour of the vessel, in which the Chinese leaves are infused, should not be neglected;—and the same applies to all the metallic vessels employed in culinary purposes;—and especially where the maintenance of temperature is the consideration.

XXXVIII. "It is difficult to discover what proportion the caloric discharged by radiation, from a body suffering reduction of temperature, bears to that which it gives out by slow communication. On this interesting subject, some experiments have been made by Leslie, and some similar have been added by Rumford. That the slow communication of caloric to the surrounding medium, has an important share in the cooling of bodies, is evident from the fact, that the celerity of cooling is different, according to the nature of that medium, being greater or less, as the matter in contact with the hot body is a better or worse conductor of caloric. A thermometer at a high temperature being suspended in the Torricellian vacuum, the time of its cooling, from 190° to 68°, was found by Rumford to be 10′ 12″. When surrounded with atmospheric air, confined in a vessel having the same space as the vacuum, the time of cooling the same extent was only 6′ 11″. If plunged in water, it would, from the general result of his experiments, have cooled in 1′ 57″, and in quicksilver in not more than 36″. And in these cases it is also found, that the different substances have suffered different augmentations of temperature, and have therefore influenced the cooling by their different conducting powers. Here it is obvious that the surrounding matter, though it might impede the radiation, has on the whole accelerated the cooling. The same fact is demonstrated by the effect of a current of air in accelerating refrigeration. Mr. Leslie exposed two tin globes, filled with warm water, the surface of one being painted with lamp-black, that of the other being uncovered to air in different states of motion. When exposed to a gentle breeze, the unpainted globe lost half its heat in 44 minutes, the painted one half its heat in 35′. When exposed to a strong breeze, the times were 23′ and 20¼′, and to a vehement breeze only 9½′ and 9′. The atmospheric current could not accelerate the radiation, but it would the slow abstraction, by removing more quickly the heated air, and applying a fresh portion at a lower temperature.

XXXIX. " The effect, on the other hand, of the radiation from a hot body, on its cooling, has been ascertained by Mr. Leslie, by observing the time of cooling in vessels, the surfaces of which radiated unequally. A hollow globe of tin, filled with warm water, was exposed to the air of a room, the temperature of which was 15 of the centigrade scale;" about 59° of Fahrenheit; " it sunk from 35° to 25° of that scale in 156 minutes. It was coated with lamp-black, and on repeating the experiment, the time requisite for the same extent of cooling was only 81 minutes. The experiment shows clearly the superiority of radiation to slow evolution, in reducing temperature; since, when the globe was covered with a substance which is a bad conductor, instead of cooling more slowly it cooled faster, from this covering promoting radiation. This proportion, however, will not be the same at all temperatures. The cooling of a body in atmospheric air, is accelerated by the current formed from the expansion the air suffers by its temperature being raised. Now, at high temperatures, the contiguous air being more quickly heated than at lower temperatures, this current ascending from the heated body will be more rapid, and will therefore have a greater effect in reducing its temperature. Accordingly, by repeating the experiment at a higher temperature, (80 degrees above that of the surrounding atmosphere,) Mr. Leslie found the proportion different: the respective rates of cooling of the unpainted and the painted ball, which, by the former experiment, were as 13° to 25°, were now as 13° to 19°; and from the two he established the general result, ' that at low temperatures, the portion of heat dissipated from a painted surface by the repetition of aërial contact, is somewhat less, and in high temperatures considerably greater, than what is spent by radiation.'—Similar differences are found to exist when experiments are made on a metallic vessel —and on the same vessel coated with isinglass, or covered with paper—or on a thermometer, with its bulb uncovered, and covered with gilding. And, lastly, the general effect of radiation in cooling bodies, is shown by the striking fact, that the peculiar nature of the surface has no effect on the celerity of cooling, when the body is immersed in water; the unpainted and the painted globe, for example, it was ascertained by Mr. Leslie, losing their heat in water with the same facility, the radiation of caloric not taking place when the body is immersed in a liquid; and hence its cooling must be effected entirely by the slow evolution of caloric, and must be dependent partly on the conducting power of the fluid, and partly on its expansibility and mobility, by which its internal motions will be regulated.

XL. "The effect of these circumstances in accelerating refrigeration, affords applications of importance in practical chemistry, and some singular facts with regard to it have been discovered by Mr. Leslie, particularly on the times of cooling, in vessels the surfaces of which are variously altered. A tin vessel, filled with boiling water cooled from 60 to 30 degrees of the centigrade scale in 81 minutes. When the sides were rubbed with quicksilver, it cooled to the same extent in 78′. The clean instrument sunk from 30° to 15° above the temperature of the air of the room, in 108′; when rubbed over with oil, in 87′; and when covered with bibulous paper soaked in oil, in 58′. The metallic vessel, filled with warm water, sunk from 20° to 10° above the temperature of the room, in 117′; when covered with a pellicle of isinglass, it cooled more quickly, and that with a celerity proportioned to the thickness of the pellicle: with one calculated to be the 50,000th of an inch thick, it sunk to the same extent in 101′; with one the 10,000th, in 82′; with one equal to the 1000th, in 63′; and with one equal to the 300th, in 61′. These results are striking, since the coverings given to the surfaces must have impaired the conducting faculty; but this was more than compensated for by the increase they gave of radiating power. If, however, these additional coverings be made too thick, they may counterbalance the increased radiation, by acting as an imperfect conducting medium. This is evident from an experiment of Pictet, in which the bulb of a thermometer, blackened by being held over the flame of a candle, was more quickly heated than when clear; but, instead of cooling faster, it cooled more slowly, in the proportion of 5 to 6; the thickness of the covering impeding the discharge by communication, more than it augmented that by radiation. Similar results were established by Rumford. Thus a metallic cylindrical vessel, with its sides bright, and filled with warm water, requiring 55 minutes to cool a certain extent; a similar vessel, when its sides were covered with linen, cooled to the same extent in 36½ minutes; when covered with a coating of glue, it cooled in 43¼ minutes; and when an additional coating was put upon it, in 37⅚′. Varnishing the surfaces had the same effect; the maximum being at 4 coatings, when it cooled in 30¼ minutes. A covering of lamp-black caused it to cool in 34′. His experiments appear also to prove, that water, in vessels of different metals, cools with the same celerity. His standard vessel was of brass; and repeating the experiments with it covered with gold and silver leaf, and in similar vessels of lead and tinned iron;—the times of cooling were in all of them the same. He concluded that the different metals have the same radiating power; but even admitting this, they differ in conducting power, and this ought to give rise to a difference in the celerity of cooling. It appears too from Mr. Leslie's experiments, that the metals differ in their radiating power, and by this the results must be varied. Perhaps these experiments throw light on each other. We have seen reason already to conclude, that the radiating is inversely as the conducting power, and they may therefore counterbalance each other; so that in vessels of different metals, the times of cooling may be nearly the same. The assertion, however, that the different metallic vessels allow water to cool with the same celerity, is inconsistent with the experiments of Richman, or the celerity with which the thermometer cools when its bulb is incased in globes of the different metals.

XLI. "The applications of the above facts, as suggesting the means of accelerating refrigeration, are obvious. Some have been particularly pointed out by Count Rumford. Polished metallic surfaces being those which radiate the least quantity of caloric, in cases where it is wished to prevent a liquid from cooling quickly, the end will be better attained by confining it in a metallic vessel, the surface of which is bright, than if it were covered with any matter, as, on the supposition of impairing its conducting power, might be done. On the other hand, in order that a liquor may cool as speedily as possible, the external surface of the vessel should be painted or blackened. Metallic tubes, for conveying or confining steam without condensing it, as those used in the steam-engine, should be kept clean and bright on their external surface, while, if our object is to condense the steam quickly, as in heating rooms by it, they ought to be painted or covered with any substance which radiates caloric abundantly." It is not heat alone which is susceptible of radiation, it would even seem that the negative state, or what is usually denominated cold, is also capable of being radiated; and, in this respect, as far as experience has reached, it seems to be obedient to the same laws as those of heat in the state of radiation. "Mr. Leslie showed that this radiant cold observes, in its relations to different bodies, the same laws as radiant heat. Like it, it differs in intensity according to the nature of the surface emitting it; and the difference is of the same nature. The cubical tin vessel employed in Mr. Leslie's experiments being filled with ice, and opposed to the thermometer in the focus of the mirror, the radiation of temperature was found to be least from the metallic surface, greater from the glass surface, and still greater when the surface opposed had been blackened. The effect varies too, according as the surface of the thermometer is altered; when it is gilt, the diminution of temperature is very inconsiderable, while, when it is blackened, it is greater than when the glass surface is opposed. Lastly, the nature of the reflecting surface gives rise to similar variations. The effect is greatest from the metallic surface, less when the mirror is of glass, and still less when its surface is covered with lamp-black. The powers of these surfaces, therefore, in radiating cold, in absorbing it, and in reflecting it, are precisely the same as their powers of radiating, absorbing, and reflecting heat. Those which radiate it best also absorb it most readily, while these two qualities are opposed to the reflecting power." It may be observed before leaving this important subject, that the dampness or dryness of air has some effect in the swiftness or slowness of its conducting power, and consequently in the heating or cooling of bodies in exposition: damp air would appear to have either a greater or lesser influence in the heating or cooling of substances conformably to circumstances. A damp day, for instance, when even of the same temperature with another day, as indicated by the thermometer, will yet give the sensation of greater cold; but this is probably most remarkable in moderately low, or rather in considerable diminution of temperature. This circumstance, therefore, is of great importance in the changeable and dampish regions of the earth, and especially in respect of the management of defence and clothing; which are principal objects of this department. The conveyance of steam in tubes is also a matter which might be turned to great advantage to ships in harbours in the colder months of the year, and also to hospital ships when such artificial heat is requisite.

XLII. In explaining the real benefits to be expected and obtained from clothing, variously coloured, much remains to be determined by experiment; and this would require to be performed in different degrees of temperature. It would require to be ascertained what the actual conducting and radiating powers of those articles employed for the purposes of covering may be in the different circumstances to which they are appropriated; and how they may vary in their defensive properties in atmospheric variableness. It must be observed also, that the same cloth may produce different influences, according to its artificial or natural colouring, its contexture, closeness or softness, thickness, &c. It has been lately remarked, that those substances which radiate caloric most powerfully, likeways absorb it most copiously; this, at first sight, would seem to involve a contradiction: black is known to have these powers in the greatest perfection. It is also vulgarly known, that black in a brisk sunny day conveys the sensation of greater warmth than any other colour; and if such a colour radiates more heat than any other, it would seem reasonable to conclude, that black has the power of attracting more caloric than any other colour. There seems to be something in the nature of black which has not hitherto been explained or rather comprehended. Some of the foregoing experiments and observations may assist in illustrating the influence of surface and colour, &c. in modifying the radiation of caloric; the conducting power of different substances is also further determined by their natural texture, solidity, &c. It may further be understood from these experiments, that if the coating of a body, radiating caloric, surpasses a certain thickness, then the increased radiation may be counteracted by the substance being rendered what may be styled an imperfect conducting intermedium. But it is difficult when and how to determine a similar condition as applicable to the articles of clothing. It seems to be proved beyond doubt, that such substances as hair, wool, fur, &c. constitute the most defensive matters for habiliments, and hence the desire that many nations, in their colder seasons, have of defending themselves with fur; as is exemplified amongst the Chinese, &c. But all this may seem an improper and unavailing deviation from the suitable objects of consideration. And the colour of the surface of the human body is one not of the smallest moment. If it be allowable to conclude, that the human dark surface is so contrived as never to absorb or conduct more slowly than what it radiates, then an agreeable and preserving æquilibrium may be established betwixt the conducting and radiating properties; this may be one cause why black people are so much affected when brought to a colder climate; perhaps the operation of radiation may proceed more swiftly than that of absorption, and consequently the surface will thus be additionally refrigerated. This is both a curious and important subject, but the extended examination of it would here lead into an amplitude of disquisition now inadmissible.

XLIII. The whiteness of the clothing is certainly a circumstance conducive to a diminution of the irritation so commonly produced by the influence of caloric, when strongly incidental or fortuitously accumulated. It seems not unreasonable to state, that a determination conformable to the general doctrine of the moderns, asserting the peculiar and specific, but graduated influence of caloric, according to the contexture, colouring, &c. of the surfaces upon which it impinges, is subject to difficulty when it is applied to the properties, blackness, and whiteness, upon the surface of the human constitution. But it is probable, that the blackamoor derives some advantages from his superficial dark coloration, which is inexplicable from any conclusions drawn from experiments made with inanimate substances. Along with the particular shade of colouring of the surface, the actual state of the skin must be taken into account, whether it is in a state of moisture or dryness, which different conditions must frequently produce an important difference even in the same individual, and in a concomitant similitude of circumstances. The unctuous or oleaginous nature of the sweat which is so commonly remarkable in the warmer climates, and occasionally in those laboriously employed and much heated in any climate, must answer some useful purpose. And from this observation it is reasonable to conclude, that the perspiration, as well as the superficial colouring, often comes to the aid of the person in exposure. Very frequently a difference in this respect may be remarked in the white and black when similarly engaged, and apparently in the same circumstances. As already observed, the augmented perspiration is commonly one of the most remarkable circumstances, when those not much accustomed to high temperature are entering upon tropical or other severely heated latitudes; and even here, custom, or former exposure, would sometimes, at least, seem to have considerable influence. A black person will not always perspire so much as a white, and perhaps this may arise from the different radiating power of his dark surface. A precaution may here be suggested of some importance to commanders of ships which are to be occupied in the torrid climes; that where much cooking is required, it would appear that the black natives generally endure the high temperature better than white people. Cooks and bakers, or others employed not only in naturally but artificially elevated temperature, as far as autoptical observation has reached, are frequently complaining, and sometimes affected with threatening distempers. The man of distinctive observation may occasionally be able (even without any previous intimation,) to distinguish those men accustomed to these circumstances; and even when dressed in their Sunday's clothes, and intermingled with a ship's company. This incontestably shows how human beings may be modified in their appearance and circumstances, agreeably to their situations and occupations, &c. On a point of equal moment, Trotter has made these remarks: that "The inhabitants of the cock-pit and bread-room are always more sallow than others: among the surgeons, I have uniformly remarked the complexion more sallow, in proportion to the size of his ship; for in frigates and smaller vessels, their cabins are in the gun-room." These artificially and prematurely superinduced appearances are owing to a combination of unpropitious circumstances.

XLIV. But let attention be bestowed upon the subjects more immediately under consideration. Although the seamen be suitably provided with clothing, yet other circumstances of remarkable importance require attention in their management; and especially the proportionate employment of habiliments, conformably to the changeable temperature and varying weather of different climates, and even the fluctuating properties of the weather, &c. of the same latitudes. Without adequate attention to this subject, a diversity of mischiefs must infallibly be produced, which otherways might be easily prevented. Sailors are often, from gross ignorance and disregard, unqualified for conducting these matters suitably to themselves. The scientifical suggestions and admonitions of the practitioner, or the favourable assistance and distinctive interference of the attentive officer or commander, are sometimes requisite. This conclusion touching seamen is not constantly applicable; for manifold exceptions to the generality of such an observation, would undoubtedly be conspicuous. There are many of such men possessing sharpness of apprehension, and clearness of understanding, and whose shrewdness of observation, experience, and subsequent conclusions, make them sufficiently circumspect in the alterations of appareling requisitely appropriate to them, in the almost indefinitely changeable and fluctuating state of atmospheric temperature. Those who have experienced a temperature undulating from 80°, 90°, &c. downwards to 32°, 20°, or even a more remarkable impressive and prejudicial declination, in which the sons of Britannia have been often exposed, require no arguments to strengthen the acknowledged suitableness of a prudent management of their exposure. A variation and difference of 20°, sometimes happening almost immediately, and especially if the instantly preceding pitch of temperature has been considerable, surely requires some degree of defence? Those who are inconsiderate or regardless of these vicissitudes, are frequently liable not only to present inconvenience, but subsequently to lingering illness or painful complaint. These atmospheric revolutions occur more particularly and importantly in harbours situated near mountains, &c. where the variableness of temperature is regulated materially by the nature of the neighbourhood—such as its elevations or depressions, the cultivated or uncultivated state of the surface. An extensive champaign, which is interspersed with morasses, and other places fit for affording and disseminating evaporations by the continued action of heat—and which operation, it may be remarked, is eminently promoted by the undulations or commotions of the atmosphere—and where afterwards these exhalations are often, in the night especially, suddenly condensed by the accidental diminution of temperature; may occasionally be productive of these inconveniencies.

XLV. In northern and southern latitudes, the depressions and elevations of temperature are more considerable, and especially when the opposite extremes are compared; but it appears satisfactorily demonstrated, that the suddenness of the degradation of it, in the warmer climates, is more severely felt than a proportional diminution in those latitudes commonly denominated temperate. A reduction of 20° or 25°, rapidly occurring—which, as lately noted, sometimes happens in harbours, &c. in which British seamen are a in state of exposure—causes more disagreeable and unfavourable impressions and consequences, than an equal decrease in the ordinarily more temperate latitudes. Some observations upon these circumstances have been formerly introduced; but as the general doctrine comprehends considerations which never can be sufficiently inculcated and practically understood, a few reiterated animadversions may not be superfluous. It is not undeserving of observation, also, that in the heat of the day sailors are frequently exposed in the solar blaze, and perspiring copiously; and that commonly, in these circumstances, they are lightly covered—perhaps little on them but a shirt and pair of trousers. As has been already sufficiently elucidated, the difference betwixt the daily and nightly temperature, is frequently, or in some situations, almost perpetually considerable. It has also been stated, that seamen are commonly thoughtless or inattentive; and thus they incautiously expose themselves to the nocturnal coolness, and often dampness; which circumstances are generally felt in proportion to the warmness and clearness of the day immediately preceding. As formerly explained, also, this will be modified by the actual state of the night: the comparative clearness or cloudiness of the night will often have an unexpected difference of impression upon those who are liable to exposure.

XLVI. Diversified considerations might here be introduced as illustrative of these circumstances; but a very abbreviated examination of the most remarkable phænomena only is admissible. After people have been exposed, for a length of time, to a temperature of 70°, 80°, or even 90° of Fahrenheit's thermometer—which last, unless in unguarded insolation, it seldom surpasses—considerable alterations become observeable and predominant, but most remarkably in the state of the circulation, perspiration, and movements or revolutions of the intestines, and to which, perhaps, may be added the appearance of the countenance. The superficial sanguineous circulation is frequently and remarkably augmented, both in swiftness and agitability. The cuticular spiramina are more expansive or dilatable, and, consequently, the surface assumes more of an oily or greasy appearance, from the increased secretion of perspiration. The lungs of some (for they have not all, peradventure, experienced such circumstances, at least not in their continuance,) are exposed to the inhalation and contact of air, of a temperature to which they have not been accustomed during the act of inspiration. This state of things must, not improbably, produce some wonderful, but imperceptible modification in the operative governance of the æquilibrium of animal temperature. It may, likeways, be mentioned, that the circulation is greatly affected from a continual stimulating impression. A diminished proportion of blood is contained and conveyed in the more internal vascular structure; the external vascular congeries is overloaded, and the cutaneous exudation copiously prepared and evaporated. If this natural excretion should be only transiently interrupted, an unnatural and irksome sensibility, (such as occasionally happens in some febrile ailments,) even to the most insignificant or inconsiderable impressions, is sometimes perceptible. An unexpected subsidence of temperature, operating almost instantly in these circumstances, will naturally cause alterations in the human system, productive of troublesome or unpleasant consequences. Anomalous, but disordered feelings, are sometimes excited by a current of the gentlest breeze, when applied partially. The distribution of the circulation, as previously subsisting, is quickly, and on that account commonly harmfully, subjected to irregularity; and this, in particular states of the constitution especially, is productive of multifarious modes of indisposition. The perspiration is suddenly interrupted, and the operations of the cutaneous structure peculiarly influenced. The nervous congeries, which is perpetually dependant upon the sanguiferous for its steadiness and continuation of capability in performing its functions, is likeways wonderfully affected, as is demonstrated by numberless irregular and unpleasant perceptions, and a proneness or opportune disposition to complaint thus accidentally introduced. Those who have been accustomed to an atmosphere of about 60°, are not so particularly susceptible of inconvenient consequences, from remarkable degradations of temperature. Amongst the inhabitants of the temperate or colder latitudes, these alterations of weather are generally more strongly resisted or repulsed by the weightier and more defensive garments which are more commonly employed. The primordial systematic composition and conformation of the natives of these territories, are excellently calculated to capacitate them for the endurance of such unavoidable mutabilities. This happy preserving faculty they seem to have, in a degree greatly surpassing that of their fellow-creatures who are the natives of the tropical latitudes. But it must be observed, that these conclusions are not deemed, with dogmatical presumption, to be constantly and invariably applicable.

XLVII. Three predominating circumstances, or qualifications rather, would seem to conspire in constituting the readiness with which the natives of the colder climates seemingly undergo the contingent application of low temperature, and in preventing it from producing any very disagreeable inconvenience. The first consideration must be, the peculiar ingenite property of systematic contexture, and of the vascular congeries, on or near the common surface; and, perhaps, of an intimate, but secretly operating sympathetic connexion, betwixt the surface and the pulmonary apparatus, and, also, of a favourable reciprocity both of sympathy and a combination of healthful firmness and simultaneous co-operation, in function and accommodation with the internal organization. And another constitutional property or habitude, so thoroughly established, and regularly transmitted, as to form a part, even a conservative part, of the constitution, and thus happily enabling it to withstand the occurrences of their native countries, and this faculty or aptitude never impaired or overthrown by the injurious exposure to the devastating influence of peregrine climates. And the third material consideration is, the important assistance which they obtain to their preservation by the sufficient protection they derive from an adequate proportion of apparel. The second circumstance specified as conducive to the general effect, is, perhaps, virtually and essentially the same with the first in the enumeration; so that there are principally two considerations, as formerly observed, which may be taken into the estimation. The last mentioned circumstance, however, the quantity, and to which may be added, the quality of the clothing, is of importance; for, although in their exposure and employments they may occasionally perspire copiously, even in the same degree of temperature, yet, *cæteris paribus*, they are not so suddenly refrigerated when their exercises are intermitted; the quantity of thick and heavy clothing conducting heat more tardily, and consequently the superficial temperature is not so speedily and directly dissipated, and the subsequent chillness is not so considerable; and thus the probability of ill effects is extensively diminished. When the natives of tropical climates are transferred to the colder, these circumstances, which assist the inhabitants of such latitudes, are to the tropical adventives not so powerfully advantageous: the suitable adaptation of their clothing is now to them the most serviceable.

XLVIII. In the disquisitions on the atmosphere, some of its influences, and especially in company with high temperature, were explained, and that progressive, but imperceptible changes, are thus wrought upon the human constitution; and the effects of some of these transmutations are very remarkable in the quantities and modifications of clothing which are rendered requisite. This proposition is exceedingly well exemplified or illustrated, but not intimately explained, in those passengers returning from the torrid climes of India, in a voyage to Britain. At embarcation, they are frequently emaciated and enfeebled; (a charming retribution for their hazards and distresses;) but for clothing, if the sun is in the northern hemisphere, the cotton (or nankeen,) articles generally suffice, unless the effeminate and weakening habit of using flannel has been adopted and constantly employed. These persons, too, are the genuine subjects who present the peculiar condition already alluded to, which disqualifies them most consummately for the endurance of the subitaneous alternations of temperature. Every fluctuation in the thermometer is, with them, a circumstance of attentive and foreboding observation. In pursuance of their undertaking, as soon as they arrive in the southern latitudes beyond the tropic of capricorn—continuing the supposition, that it is the summer season when they forsake the Indian confines—they are consequently immersed in the winter which will then be reigning in those latitudes in which they are then occupied. The thermometer may have descended to 60°, or even sometimes to a still more considerable declination. This temperature, which they would, in their native country, have deemed moderate and agreeable, now appears to be very unfriendly and ungrateful to their feelings and constitutions. Upon them, indeed, it often seems to have as wonderful and powerful an influence, as the transition of healthy Britons from the solstitial to the hibernal temperature has upon their constitutions. They are necessitated to employ a threefold or even fourfold proportion of clothing, compared to that which formerly sufficed them in the same temperature. From the changed condition of their systems, the resisting powers to the operation of cold become relatively impaired; and now defence, with the proportionate accumulation of garments, is the only mode of accommodation.

XLIX. This digression from the more immediate disposition of this part of the undertaking, will, it is expected, be allowable as a conclusive argument, calculated to encourage a suitable attention to the employment of the necessary quantities of clothing, agreeably to the need of respective individuals; and this applies not only to these necessities as originally subsisting, but as they may have been accidentally introduced. It is physically impossible to propound sufficient information and regulations which may be invariably applicable in every accidental situation.

The discernment of those officially interested, in combination with attentive and calculating observation and experience instituted thereupon, will oftentimes be serviceable in commending its employment, and regulating its adaptation. The medical officer, however, from his knowledge of the human constitution, and the particular capabilities of individuals, should be fitted for affording instructions to the men, conformably to the particularities of predominating circumstances. As formerly observed, these remarks are neither necessary nor applied to all seamen without distinction or discrimination. Several experienced seafaring men can regulate and proportion their apparel, accordingly to the different mutabilities of temperature, with more propriety and exactness than they would even by the most elaborate instructions artificially communicated. This serviceable management originates from an aggregation of many circumstances. A primogenially implanted, and progressively strengthened promptitude, to regard every thing supporting or maintaining their own happiness; a praiseworthy and intelligent distinction, amidst the numerous occurrences of human life, with a view to preservative considerations; and also a commendable and advantageous acquisition of knowledge; and the information communicated by preceptive and exemplary observance. "Sed in omnibus ferè minus valent præcepta quam experimenta." As formerly and repeatedly insinuated, there are many, it may be remarked, who, natively ignorant and unreasonably thoughtless, seldom or never adjust their clothing in a manner suitable to their accompanying circumstances; and what is too frequently and lamentably remarkable, and particularly in merchantmen, is, that they are unprovided with a convenient assortment. And inquiry may be made, for what reason they are not in possession of the adequate supplies? to this the answer is very ready; the needful article by which it is obtainable is commonly squandered for other unbecoming and infatuating purposes, such as procuring ardent spirits when in harbours, &c. And, whilst touching slightly upon this subject, another observation may be made, relatively to some practices subsisting in those ships employed by the company of merchants trading betwixt Britain and the Oriental territories; and one of these is—the reproveable imperfection, or rather the authenticated impropriety (to designate wickedness by so complacent an appellation,) of the unreasonable overcharge upon the trumpery commonly furnished under the name of clothing to their ships' companies. It is immaterial with whom the evil may commence, if it is allowed to subsist unrestrained.

L. In relation to the abuse committed by sailors in dissipating the means with which they should procure clothing and other necessaries, the following observations of a person, whose opportunities for determining the consequences of their inconsideration and foolishness, in these circumstances, may here be introduced, as in some measure illustrating and confirming the reasonableness of some of these animadversions. "It has been observed, that the men belonging to the boats," and, consequently, having frequently opportunity of doing mischief on shore, "are more frequently diseased than any other equal proportion of the ships' company. The reasons are obvious: they are more exposed to the weather. They frequently get wet on going on shore, or become so there, and in that condition they often remain many hours, waiting on the beach for some giddy and unthinking officer, who, amidst his own enjoyments, thinks too little on the sufferings of the boat's crew. Upon the return to the ship, instead of care being taken that they shift themselves, and are made comfortable, they pass unnoticed, and suffered to continue in that condition until their clothes dry upon their bodies. —The boats' crews of a ship are generally ragged as well as sickly. They too often sell their cloaths to buy *liquor*, but too often also they part with them to buy food, on account of their being unnecessarily kept on shore, to the loss of their regular meals with the rest of the ships' company. It may with truth be said, that the inattention to the boats' crews of his Majesty's ships, is amongst the principal irregularities in the navy that require correction; for it destroys their health, and is a great cause of desertion." These observations are of importance, not only in the service above-mentioned, but also in a greater or lesser degree to those vessels engaged in commercial speculations; for as long as a sailor has a trifle to spare, it is generally expended in foolishness and extravagance.

LI. Notwithstanding the repeated opportunities of witnessing the mournful consequences of bacchanalian irregularities, the following notification comprehends circumstances so truly characteristic of the sailor, and testifying so forcibly the occasional dreadful effects of their excesses, as have never been autoptically observeable. " Three years ago, when I was surgeon of the Kangaroo, it was our misfortune to encounter a severe gale of wind in Dublin bay. By a train of adverse occurrences we were compelled, at the imminent hazard of our lives, to cut our only remaining cable, and attempt to get over Dublin bar. This we happily effected after very severe exertions.—When moored in safety in the river Liffey, the people, being obliged from the state of the ship to be moved into a light collier, gave themselves up to every excess which seamen, who have recently escaped from imminent perils, are then accustomed to. An almost general intoxication prevailed among the heedless crew during the whole night. The unvarnished tale of Othello was twice told over, with the addition of every hyperbole which the fertile invention of seamen, of drunken seamen, could devise. The can went merrily round the whole night. But alas! the morning sun ushered in a scene, which, at this distance of time, thrills my heart while I relate it. Two boon companions had enjoyed themselves in a superior degree; both of them the day before in perfect health. They retired at bed-time to keep it up for the night, having by some means procured abundance of *whiskey*. Libation after libation of this poisonous draught rendered them insensible. When the hands were turned up next morning, one was found dead, and the other sitting by him with the greatest marks of kindness and affection; alternately kissing him, and offering him liquor, and encouraging him, by every endearing expression, to drink; and then pouring it into his mouth. By the utmost exertions the life of one was saved, but the other irrecoverably perished. Upon examining the pockets of the deceased, the inclosed scrap was found, which I have carefully preserved. In these formulæ, we have as well the method they have of entrapping a girl, as a rat and coney, exclusive of the means they use to deceive the doctor."

LII. Among the inconsiderate, and those who wilfully and obstinately deprive themselves of the requisite coverings for their protection against the ordinary inclemency of the weather, &c. an attentive and distinctive management must be perpetually administered. Observation and experience—for these appropriate and corroborative expressions may be repeatedly summoned into employment—which necessarily caused uneasiness, nay solicitude, suggest the propriety of these animadversions The miserable and disgraceful catalogue might be considerably extended; but this would constitute an ungracious, an ungrateful, and perchance an ineffectual undertaking. But, to apply the general doctrine more pertinently to the principal subject under examination, each man, when exposed in the more variable northern latitudes, should be provided with at least three changes of woollen apparel, and loose jackets, for defence in the coldest seasons, or nocturnal watchings; he should, likeways, be furnished with a convenient and comfortable assortment of the lighter articles of clothing, for the warmer weather of these latitudes. In unusually inclement weather, the extremities especially should be always in a state of adequate and sufficient protection. This is a consideration of the highest importance, and the neglect of which may be succeeded by the most unfavourable consequences. The imposition or observance of particular restrictions, in the predominance of such disagreeable circumstances, would be most preposterous and inconsistent. The objections formerly stated against the improper use of woollen garments, occasionally, even in the warmest climates, are not now applicable; but, contrarily, these investments are now the most commendable. As before explained, they retain, in a manner superior to most other substances, the unassimilated temperature continually flowing from the superfice; and thus, as far as such contrivances can effectuate, lessen its prejudicial dissipation. They constitute, on this account, imperfect intermedia for transmitting the matter of heat, and are therefore serviceable, when interposed betwixt the body and the circumambient atmosphere. The animal temperature is thus powerfully maintained at the skin, where the unfavourable and destructive action of lowered temperature principally commences, and subsequently its penetrating operation is successively propagated through the whole constitution. A superficial chilliness is commonly the first inconvenience, and in proportion to the extensiveness, continuance, &c. of this occurrence, the person exposed is in some measure able to anticipate the propriety of augmenting the quantity, &c. of his habiliments.

LIII. And, as some of the following observations and expositions are designedly considered as more particularly and immediately applicable to the Indiamen voyaging betwixt Britain and the East Indies, some additional notifications and animadversions seem not altogether unnecessary. And here the developement of imperfection and inconsistency, the proposition of suitable and adequate admonitory and corrective assistances, and the enforcement of compliance, would need an amplitude of unpleasant disquisition, and also the occupancy of a compelling authority; the first of insufferable tediousness, and the other not conveniently obtainable. The errors committed respecting some of the matters referred to in merchant vessels especially, are more frequent and less regarded than in the Royal Navy; in which latter, those things which relate to the happiness and preservation of the men, are more particularly and continually the pleasing objects of consideration. The men commonly cannot dispose of their garments, &c. with such impunity and rashness. More attention is bestowed upon their being properly furnished with a necessary proportion and adjustment of their clothing. But in the Indiamen, for example, many improvident men may be seen, who sometimes have not a sufficiency to shroud their nakedness. This is an evil of long standing, and, as far as understood, is not counteracted, as would have been commendable. In all employments, in which selfishness surpasses every other communicable consideration of a beneficent description, much kindness to fellow-creatures cannot naturally be expected. In vessels occupied in mercantile and other commercial proceedings, the attainment of the object, keenly held in view, is almost exclusively predominating; and if the men embarked for one voyage (commonly,) fulfil the end designed, this is all respecting them which is contemplated.

LIV. These hireling vessels of commerce are generally preparing for their departure from England in the course of the colder months; winter and spring are the most common occasions for beginning these voyages, but in peaceful times they may sail at all opportunities. Those who are employed, and may have performed voyages in these merchantmen, will sufficiently understand what beautiful collections or assemblages are embarked as ships' companies. In warlike times they consist, generally speaking, of miserable creatures, of different tongues, kindreds, and languages, vagabonds and barbarians, who are often abandoned and destitute of every requisite; and to complete their misery, they, previously to embarcation, are ordinarily in the hands of the execrable Hebrews, and thus become the objects of nefarious traffic. Destitute, therefore, even of adequate clothing, and sometimes altogether unprovided with bedding or bedclothes, and other suitable furniture of this kind, they are unavoidably in a state of exposure to all the difficulties and hardships naturally accompanying their miserable, or rather commiserable circumstances. These hopeless wretches become the subjects of multiform distempers, (or are frequently already labouring under different maladies in a state of concealment,) and indescribable inconveniencies, and unintermitting sources of perplexity and annoyance to the officiating practitioner. After enduring (if they withstand and overcome the immediate impulses of these attending mischiefs,) the inclemency of a rigorous winter, and the misfortunes with which they have been encompassed, they at last advance, in the performance of their voyage, towards a warmer climate. Prosecuting the passage through tropical or other warm latitudes, a moderate proportion of clothing will then be sufficient; but here it may be remarked, that the pitiful quantity which they may have in possession, is almost constantly unsuitable for these latitudes: they are generally the horrible fragments of woollen garments, and which are almost invariably and copiously filled with the most abominable filthiness.

LV. The description is not accomplished, and it would truly involve much difficulty to make it tolerably complete. As the voyage of departure frequently commences in the vernal season, they are consequently subjected to the operation of another winter, while traversing the southern latitudes. Those who are acquainted with a passage to the East Indies, and the hydrography it comprehends, do not here require any illustrative animadversions. Against the repeated impressions of a hibernal diminution of temperature, they are still more unequally prepared. And although the depression of heat may not be so excessive as that which they have antecedently experienced in Britain, nevertheless, by the particular modification induced in their constitutions by the augmented temperature, in all its consequences, they have now less sufficiency in opposing its injurious influences. This is exemplified in passing the Cape of Good Hope, and afterwards while the course lies nearly in the parallel latitudes. This, however, is not a satisfactory delineation of circumstances. In the returning passage, more lamentable spectacles of distress are sometimes, to the intelligent and humane practitioner, painfully conspicuous. These observations and conclusions are applicable to any destinations which lead through intervening high, and then terminate in considerably diminished temperature. In voyages to the West Indies, after having left Britain for some time, the temperature is never so low as to prove particularly inconvenient. But it may here be observed, that the boatmen, as already mentioned, as stated by a medical officer, dispose of their clothes not only in this country, but that may happen in any harbour where the disposal or exchange of their coverings can procure them the infatuating beverage which is so peculiarly the object of delectation. It is the natural disposition and inclination of all worthless and profligate seamen, to make even their necessary garments, bedclothes, &c. subservient to the attainment of the object of their grovelling and unhallowed gratification.

LVI. As it commonly happens in the most distant eastern voyages, they arrive on the Chinese frontiers in August, September, October, &c. but strictly speaking, from September to January (with variable exceptions,) is, or has been, the ordinary time of their arrival. Sometimes in September and October, the temperature continues with little diminution, and there is probably on this account no immediate need of substantial habiliments. Those who are in possession of a few remaining garments are frequently disposed to give them for an article, which is to them, either immediately or consequently, very prejudicial; and to those with debilitated or undermined constitutions, too often irremediably detrimental or absolutely destructive. And here a mischief presents, demanding the most careful attention; for, in this manner, several of these misguided and irrational wretches, by their continued and indiscreet use of the deleterious liquors of the country, (and although the observation here may be particular, yet, as founded on general principles, the conclusions regularly deducible are pretty extensively applicable;) and other concomitant irregularities, frequently exterminate the unhappy remainder of an execrable, unfriended, and unlamented temporal existence, "Illud notabile ex diversis MORS misera non est, aditus ad mortem miser est." In no service, perhaps, is there greater mischief produced than in those vessels employed by the East India Company while they remain at Whampoô. The careless men who constitute their crews, frequently dispose of the miserable remains of their woollen garments; if they have even a blanket or two, all are commonly exchanged for the infernal *seau tcheou*, vulgarly denominated Samsoô; (which to them is a perverting mischief, and sometimes indirectly conducive to their destruction;) or other trumpery, the most insignificant or unassisting. As long as the weather continues temperate, they unweetingly or rather incorrigibly and unwarrantably conclude, that the coverings which they have transferred, would, if retained, have only been an encumbrance. A short time, however, convinces them of the evil of their unlucky mistake; and, when shuddering in the cold fit of an intermittent, the remembrance of their imprudence (but they do not always possess any rational reflection,) only aggravates the troublesomeness of their disappointment. This deficiency of clothing, bedclothes, &c. not only tends to the production of complaints, but also to their recrudescence; and the cure of some thus becomes inconvenient, if not absolutely impracticable.

LVII. The hopeless and imprudent men who have dispersed their necessary raiment, sometimes even their bedclothes, and who, perhaps unexpectedly, outlived the more immediate consequences of their very blameable rashness, are now in a state of contemptible survivorship to encounter the homeward voyage. These unhappy men after being, perhaps, released repeatedly from different complaints, are again successively exposed to the naturally happening vicissitudes of temperature, and often painfully experience the inconveniencies of their foolishness and inconsideration; and more especially in their recurrency, when in the latitudes lying off the African promontory. A renovated progression through all the tropical latitudes once more awaits them, but of the future they seldom have any intelligent anticipation. And another circumstance which may occasionally happen, but which apparently does not enter their preparative calculations, is, that winter may have assumed his rigorous command upon their approach to Britain; and thus they are again exposed to an accumulation of unfavourable circumstances. All those employed in, or passengers by merchantmen, especially those trafficking betwixt Britain and the Oriental settlements, must have observed, that those miserable creatures the lascars have often suffered materially and shamefully. But since the happy return of peace, they are, perhaps, not so commonly employed, as a sufficiency of disengaged British subjects can be obtained for these purposes. The declination of temperature from perhaps 120°, which they might in their native regions have experienced in unsheltered exposition, or even only a few weeks before their arrival at Britain, down to 20°, is to them a most remarkable and impressive disagreement. Some exemplifications of inconvenience are occasionally observeable among those even who may be in higher stations than common seamen, and who should be in possession of more beneficial intelligence, but who, either from heedlessness, lavishness, or impossibility, are not adequately furnished with defensive necessaries. And a rule of material moment may be suggested, that the natives of the warm climes, when brought into the cold, are strongly inclined to approach artificial heat, they thus, after being severely chilled, often produce much mischief; but especially to their hands, feet, legs, &c. by inducing chilblains, and other painful phlogistic affections. Sailors, of whatever country, should carefully shun going near a large fire when they happen to be much cooled or benumbed; they should rather employ friction, until their hands, &c. recover sensibility, and evolve an agreeable portion of warmth, by exercise regularly continued. They should never be allowed to pass suddenly from severe cold into high temperature.

LVIII. The importance of these reflections, their true application and adjustment, can be adequately comprehended and acknowledged by those practitioners, and of those, the discriminating part only, who have adventured themselves in the uncomfortable and disagreeable circumstances, with which in these voyages they are so unintermittingly encompassed. A multifarious accumulation of inconveniencies and embarrassments are fit for enumeration, but incomplete communication must be deemed all that is here consistently admissible. Those wretched seamen, who are without the requisite quantities and qualities of apparel, are in their homeward-bound destination uncommonly liable to different complaints, and thus, the number upon the sick list is commonly largest in a returning voyage, even in apparently similar circumstances. Unprovided as they frequently are with any alimentary allowance but the ship's customary supplies, their restoration is too commonly impossible, or at the best exceedingly protracted and problematical. As they are by inevitable necessity frequently labouring under some indisposition, so the desperate difficulty and unavailing application of restorative assistance, medicinally considered, and ministration, have been sufficiently demonstrated to wearisome observation and lamentable experience. Although they may conditionally be allowed a sufficient proportion of clothing in the continuance of one of these voyages, it is very rarely accommodated to the particularities of their constitutions, and the changeable nature of circumstances. The men not uncommonly, but most preposterously, use the woollen trousers in a heat of 84°, and, reversely, perhaps when the thermometer is at 60° or 50°, or even a descent still more remarkable, the pitiful cotton or nankeen upon the legs and thighs singly constitutes their envelopement. These are inconsistencies and improprieties which are not irremediable, but might be obviated by the proportionate distribution of clothing, conformably to the permutations to which they may successively and contingently be necessarily exposeable, with the enforcement of its commendable appropriation.

LIX. The forementioned allowance of garments to individuals, whether it may have been applicable or unsuitable, nevertheless, if the greater proportion of it has been received before the conclusion of the outward-bound passage, it is often incautiously, as formerly explained; because then not immediately or particularly serviceable, too often adjudged as cumbersome and unnecessary, and squandered, as above-mentioned. The mischief, it is hoped, is not extensively predominant, being much under the regulated management of commanders and others interested in, and responsible for, their ship's companies. The prevalence of this evil, however, cannot be contradicted; and the propensity of seamen to this wickedness is deep rooted, and its accomplishment done with inconceivable cunningness and unwarrantable stubbornness. And here the introduction of a sorrowful tale may be allowable, and this in reference to matters of high moment, and virtually influencing the strictly medical department; for without the necessary collateral assistances, the medical man's efforts must labour under insurmountable embarrassments. The medical attendant may in his practice observe faithfully, he may distinguish, yea, discriminate perspicuously, and he may prescribe scientifically, and he may administer most judiciously, but notwithstanding all these commendable qualifications and associations of professional knowledge and acquitment, he also, from a conjunction of unpropitious circumstances, a complication which *his* power cannot contravene, after all his most honourable endeavours, will too frequently, and most vexatiously, be disappointed. "Quod medicorum est promittunt medici."—"Nisi forte Jovem quidem Phidias optimè fecit, illa autem, quæ in ornamentum operis ejus accedunt, alius melius elaborâsset; aut orator loqui nesciet; aut leviores morbos curare non poterit medicus præstantissimus."

LX. In the British navy, strictly so called, some of these uncomfortable circumstances are not so remarkable; there systematic regulations commonly operate for the assistance and preservation of ships' companies, and also, when necessary, for their wholesome chastisement. They are there, moreover, more carefully precluded the possibility of commuting their clothing for substances, which, either straightly or indirectly, accelerate their untimely destruction. But this conclusion, even in any situation of naval service, is not continually applicable, for, as may be sufficiently understood from some of the foregoing observations, these evils are too frequently prevailing. Seamen, although they are ordinarily considered in no other light than mechanical implements for the fulfilment of particular purposes, nevertheless, they require a portion of conducting and protecting kindness. Commendable and honourable it is for all workmen to preserve the instruments of their particular handicrafts, or occupations, as long in a condition, fit for use, as possible, "Nam qui non servet perdat." Hapless mortals, they are generally thoughtless or inconsiderate, the transient pleasures of the fleeting moment are the fascinating gratifications of their immediate but capricious inclinations; seldom possessing any calculating reflections for the consequences. This, as formerly observed, should not, as too frequently happens, be employed against them as a negative argument. If they cannot, through inaptitude, deficiency of knowledge, or even blameable inattention, or misconduct, discreetly regulate themselves, a friendly assistance should always be protended for their acceptance. Concerning their clothes, therefore, it will frequently be requisite to impose particular modifications and restrictions; they should, when necessary, be subjected to absolute regulations, and their disposal, or exchange, prohibited by the most positively operative injunctions.

LXI. At the commencement of an Indian voyage they should be provided with at least three changes, or suits of apparel, complete in all its particulars. This should be supplied or furnished to them at a moderate price, not at an intolerable and ungracious overcharge. "An est ullum majus malum turpitudine? quæ si in deformitate corporis habet aliquid offensionis, quanta illa depravatio et fœditas turpificati animi debet videri? Ah! Turpilucricupidi, equidem ad vilem usum et sordidum aurum accingimur." A consideration demanding attention, is, that they also be furnished with several pairs of shoes, even although they may appear to be useless furniture in a tropical climate, and not commonly employed, yet in these situations they should not always be neglected. By this precaution, as formerly hinted, many of the slighter injuries to which the lower limbs are liable, might be easily and usefully prevented. But, as may readily be comprehended from these animadversions, it is not enough that they be provided with these necessary quantities of clothing, it is likeways adviseable, that they should be obliged to preserve this allotment of garments in as complete a state as possible. And, if in some instances, from the profligate propensities of individuals, there should be any danger of their squandering, or uselessly, or rather injuriously expending their clothing, they should be carefully put under restriction, and, perhaps, only the quantity in immediate occupation intrusted to their own management. It must also be now easily understood, that the clothes should be changed according to the variableness of circumstances.

LXII. Agreeably to these observations, which originate in principles of humanity, benevolence, and an ardent wish for Britain's prosperity and successful commerce, they should constantly be supplied with the suitable and necessary clothing at their departure. The seamen, thus furnished with a convenient assortment of garments, made of the commendable fineness and thickness, in conformity to the manifold vicissitudes of weather and climate, &c. in the continuance of their peregrinations, they will be in a condition of defence and equipment suited to their circumstances, as far as conveniently obtainable. In voyages towards the Eastern territories, an additional supply of light clothes, proper for the warmer climates, could be cheaply procured in China or other settlements. This supply would answer their purpose both in these countries or in the warmer regions, during the returning voyage, and in the summers of the commonly temperate latitudes. Much mischief has been done to the health of seamen by their frequently incongruous mode of clothing, permitted even in the scorching climates in merchant vessels, where little attention is commonly bestowed upon the welfare and health of seamen, and where they are often allowed to use the common heavy clothes, which would be more suitable in their native countries. The propriety of light clothing in the warmer regions is so conspicuous, that the affair hardly requires any additional explanation. It may be observed, however, that the body may be too thinly covered; or if some parts of it are altogether bare, the skin may be irritated, or even blistered, by the force of the sun's influence. And it should not be disregarded, that when sailors are returning from warm climes directly to the influence of a British winter, for example, they should be properly defended from the rigours of its operation. The change is of great moment, and of unexpected force upon the human constitution. Although the latter has a wonderful power, or faculty rather, of accommodation, yet this only extends, in all cases, to a certain degree; and, if the harmful operation is continued beyond this pitch, it must prove injurious. This is of singular interest, in reference to invalids, and those returning to their native country with impaired constitutions.

LXIII. The specification of every trifling circumstance would lead into a great length of discussion. After the experience of so many years, and especially continuing the last warlike struggle, the clothing and exposure of the seafaring are tolerably well understood; and several have supplied information on these subjects, but still much is wanting to render the matter complete. It may, before leaving this part of the undertaking, be observed, that seamen are often careless in changing themselves, after having been wetted with rain or otherways; or they, not uncommonly, even when drenched to the skin, turn into their hammocks, with the whole or part of their clothes unremoved, or at least with their damp shirts; and in this manner, many careless, obstinate, or awkward fellows, bring on diseases of different descriptions; but in the young and vigorous, more particularly of an inflammatory nature. Sailors, also, when they become fatigued, or sleepy and heavy, frequently recline themselves upon a damp deck; or during their watch above, when not actually employed, they often recline in this manner, and thus, also, complaints are frequently engendered. But further on this head—sailors may suffer damage by simply sitting in their wet or damp clothes. Sometimes they receive mischief from the dampness of their hammocks or bedding, &c.; and this may happen either from a leaky ship, or from the bedclothes having been moistened when they may have been exposed in the daytime. Sailors, also, when in a state of inebriation, would require some attention; for frequently, when in this condition, they receive hurt not only from lying on damp decks, but from blows and bruises, of which they are scarcely sensible at the time of reception. Officers and others who may have the charge of sailors, should, therefore, bestow proper attention that the men are regular and duly careful in managing this part of an important consideration in the preservation of their healthiness. It is not enough that they should put off their wet clothes; they should also be properly dried again before their employment. As in northern climates, seamen are naturally exposed to much moisture and rainy weather, it would be adviseable, and also beneficial, that they should be defended with external coverings which were impenetrable to moisture. This might be effected at a moderate expense; and, at same time, these tunics might be so light as not to be troublesome or embarrassing by their heaviness. These are propositions of undeniable importance in the British service, whether belligerent or commercial, in which seamen are necessarily so much exposed in coldness and dampness. Some sailors are naturally so prudent and industrious, as to contrive or fit pitched garments to themselves, and also in this manner render their hats water-proof; but this is not such a frequent or common practice as might be commendable for the defence of whole ships' companies.

LXIV. And thus far the consideration of wearing apparel, intended for the common seafaring people; but some other circumstances belonging to this department need a little examination. And although it may be remarked, that seamen are generally vigorous, and hardened by continual exposure to every variation of weather; they are, however, not endowed with the faculty of perpetual and unceasing action, and uninterrupted wakefulness. At particular periods, places for reclining or reposing become necessary, where they may depose themselves, and recruit the damage sustained by their previous labours, and mitigate and remove the irksome feelings so often produced by their rigorous services. The hammock, or swinging bed, is the ordinary machine employed, and appears tolerably well adapted to the purpose. This contrivance is generally made of hempen materials: the mattress is formed of different substances, hemp, cotton, flax, wool, &c. and its contents, or stuffing, are likeways composed of different materials. This is a subject of the utmost interest in the welfare of sailors, although it is too often disregarded, or considered as an object of little importance; but the experienced marine surgeon must have a different view of the subject, and will be satisfied and convinced, that sometimes the success of his medical practice may have much depended upon the suitableness of this kind of accommodation. How many instances of disease, and especially in trading vessels, have been produced from want of even attention to the articles of bedding, bedclothes, &c. The history of the British navy, too, affords melancholy illustration of the mischiefs thus frequently introduced. The subject is of great moment, also, when applied to recruits going to distant settlements, and the East Indies especially, where the passage implies a length of time, and also considerable vicissitudes of temperature. Several recruits have thus been lost to the service, even after a considerable expense thrown away upon them, which thus becomes an absolute loss: in this manner, the Honourable East India Company's military service has materially suffered. Those creatures going out under the name of Recruits, are commonly the most worthless and abandoned of mankind; and sometimes the most careless and imprudent of them, as soon as they arrive in the warmer latitudes, either designedly throw away, or accidentally lose their mattresses, if they had any; or even hammock and bedclothes are committed to the deep waters, as now only useless lumber: but these foolish men commonly suffer in the cool latitudes off the Cape of Good Hope, when they come to lie upon the deck, and tossed about with every storm to which they may then especially be obnoxious. Nothing but the greatest vigilance and strictness of management will suffice with such miscreants; and after all, the observant officer and intelligent practitioner will too often have cause to bewail the unfortunate consequences. Different affections about the joints, as the thigh-joint, abscesses in some part of the lower limbs, or universal unhealthiness, are some of these consequential and disqualifying misfortunes.

LXV. The adaptation and cleanness of their bedding, blankets, coverlets, &c. require as much attention as that proposed and judged necessary in their common clothing. By neglect of supplying or maintaining a sufficiency of comfortable bedclothes, in combination with other commodious circumstances, during repose, the application of any other kindness and assistance will be in proportion unavailing. The mattresses intended for foreign climates, should be made with hair properly cleaned and prepared. The hurds, or coarser part of flax, may likeways answer; but wool, cotton, &c. should never be employed for these purposes, and especially in the warmer climates. These last-mentioned articles are fruitful collectors, and obstinate retainers, of the corporeal discharges of the person who lies upon them; and they are substances, also, which afterwards are not conveniently disentangled from their incorporated filthiness. The quantity of stuffing should be moderate, otherways they accumulate too much heat; which, in tropical or other warm climates, especially, becomes the cause of considerable uneasiness. On this account alone, wool, feathers, &c. or other substances which retain heat, or are bad conductors of caloric, as they are occasionally denominated, are, in these situations, particularly objectionable. Mattresses prepared with the bamboo shavings, as they are often made in China, will be very convenient; and nothing more suitable in tropical, or indeed in any other latitudes. They are preventative of contemptible and disgraceful effeminacy, and promotive of hardihood, which is always a valuable property in possession; and they are conducive to maintaining that coolness, which in these countries is always so desireable and comfortable. These last materials, therefore, are the best for stuffing mattresses in the tropical latitudes; they accumulate less nastiness and troublesome heat than some of the forementioned substances. As sailors' mattresses are often the repositories of much filth, or even become the retainers of contagious impurities, too much caution cannot be sometimes employed in preventing mischief arising from this circumstance. And, as a means of keeping their contents as clean and free of any mischievous inquination as possible, the external coverings of the mattress, which may be made of closely woven canvas, should be defended by the application of some kind of pigment, or otherways so prepared as to resist the ingress of any extraneous substance whatever: and if thus prepared, their outward surface might be occasionally washed with soap and water, and constantly kept in a state of sufficient cleanness. The painting of the coverings of the mattresses is not a new proposal, but it is generally, it is reasonable to conclude, little regarded; but the adoption of which would be, in many respects, wonderfully serviceable.

LXVI. From the particular manner in which the hammocks are connected, at their extremities, to their supporting cords, (lanyards, marine phrase,) they are, in some degree, gathered or collected upon the person whom they contain. This, in hot climates, is remarkably unpleasant, and sometimes distressing. The people suspended and almost inclosed in these machines, are thus disagreeably surrounded with their own atmosphere, and the vaporations which they are perpetually disengaging. This occasionally troublesome inconvenience is thus explicable: The canvas composing the hammock itself is an oblong square, the extremities, or most distants sides of which, are furnished with holes, and to these strings are fastened, and their remotest or more distant extremities are carried through an iron ring or circle, from which extends a cord (already mentioned,) for annexing the hammocks to a point of support. And thus, when the body of the hammock is stretched down by the incumbency of its nocturnal possessor, it is contracted around him in the manner aforementioned. These evils are susceptible of immediate amendment; and this may be obtained, by placing a wooden scantling betwixt the opposite corners of the hammocks. This stretching and expansion of the extremity towards which the person's head is inclined, would be particularly serviceable, and especially in confinement and calmness of the atmosphere. The bolsters, or pillows, should be formed of substances possessing properties similar to those recommended for the mattresses. A commendable precaution for the men is, also, that they repose themselves with their heads in a state of proper elevation. A sailor is in general an ignorant and stubborn creature, and he frequently lays himself awkwardly, with his head more depressed than his other extremity. The person who has thus lain improperly, may often, on the following morning, be easily discoverable, by eyes suffused, and inflation and confusion of countenance. The hammocks being properly expanded at the extremities, they are thus exposed to the influence of the air surrounding; and if any ventilation or change of air takes place, the effluvia emanating from the surface are thus more expeditely dissipated.

LXVII. Blankets are the common coverings which sailors procure and employ. In the colder latitudes this is allowable, and in general to be preferred, but in the warmer they are often improper and unsuitable. A supply of sheeting should be always permitted and used in the tropical latitudes, and for this purpose, those made of cotton are better than prepared from any other materials. By a judicious attention to a proper supply of these articles, the people will receive comfort and benefit, which they at present, as only furnished with blankets, in what climate soever, cannot possibly attain. Blankets in the torrid zone are seldom useful; so that, in the temperature ordinarily prevailing in those climates, they are considered as only troublesome lumber, and the worthless sailor commonly disposes of them the first opportunity. The people, therefore, must either remain uncovered in their hammocks, or if they do use a blanket, then they are fomented in their own moisture. The woollen tegument imbibes till it is completely contaminated with filthiness; the more liquid or volatile part may, indeed, be exhaled and dispersed, but the grosser colluvies embodied in the covering remains offensively disagreeable. This miserable and noisome wrapper is allowed to continue, not for days and weeks only, but sometimes for the space of several months. In some of the ships employed in the service of the foresaid company, they are not once submitted to the operation of cleansing during a whole voyage. These are faithful hints, but the description must remain unfinished: no service exists without its improprieties and imperfections. But some of the forementioned are removeable evils, and on this account should not be tolerated. The immersion (if the expression be applicable,) in such an additional proportion of extraneous temperature, accumulated and detained by a misapplied article of covering, causes an increased disposition to perspiration, and also to several cutaneous diseases—and especially in sailors, who are so commonly uncleanly—and also an augmented proneness to distemper, and the whole aggregate of misfortune almost invariably aggravated by abominable dirtiness.

LXVIII. It may be observed, in general, with reference to this business, that it should be considered as a regulation, that when the temperature is not under 70° of Fahrenheit, one sheet, or this with a cotton coverlet, to a person in health will be perfectly sufficient; whereas, in such circumstances, if the person is not thus provided, he must either lie under a blanket, or be freely exposed, and thus be liable to the operation of an unpleasant alternative. In high temperature, even the lighter coverings will often not be used; in such a state of things, even the contact of a woollen garment to the surface, and especially when not much accustomed to its impression, becomes disagreeable; and in lower degrees of heat, down to 70°, 65°, &c. the cotton coverings, as mentioned, will then be much more agreeable and convenient than blankets. The particular management of the quantities occasionally and contingently requisite, must be regulated conformably to the continually fluctuating nature of circumstances. Instructions surely do not become necessary to establish a distinctive observance of these suggestions in the torrid or frigid zone, or in the intermediate and commonly reputed temperate latitudes. A person instantly translated from a temperature of 82° (which at sea, and uninfluenced by the terrestrial superfice, or other improper exposure, is nearly the ordinary maximum,) to that of 32°, or the point indicative of congelation, would require an increase of clothing to twelve or sixteen times his former quantity, and even then he would perhaps not be adequately shielded from its unpleasant and trying impressions. The boundaries concluded or shut in by the most extensive circumscription, being in the comprehension of ascertainment, all the intermediate proportions are forthwith determinable. In the variable, or what are otherways, from their periodical mildness, denominated the temperate latitudes, preparations against the subtractions of temperature are the most commendable and advantageous. The sufficient defence of seamen at night in their hammocks, and the dryness of these, with their bedclothes, are considerations of particular importance. Even although in the colder regions, the men should be properly furnished with wearing apparel in the daytime, yet, if they are not properly defended in the night, their healths may thus become certainly and materially impaired. The most diligent heed should therefore be taken, that the men are always in possession of a sufficient stock of bedclothes, especially in the cold latitudes. By neglect of discreetly managing this part of their protection, sailors frequently suffer in their constitutional healthiness, and are rendered afterwards unfit for active employment.

LXIX. Additional observations and explanations might be introduced, but at present they are seemingly unnecessary; and this part of these hasty notes upon the clothing, bedding, &c. of seamen, shall be closed with the following general remarks. As formerly expressed, this subject of clothing or raiment, examined upon general principles, appears, amongst the civilized part of mankind, the third particular and important consideration in their happiness, or even in their preservation. It is a subject demanding more attention, and especially amongst seamen, than it has hitherto received. The fulfilment, the completion of particular formalities, will not be sufficient. The qualities, quantities, and suitable employment, as suggested by the prevalence of particular concomitants, needfully claim attention. Some of those properties which are agreeable and useful in clothing, have been cursorily mentioned; and also a few scattered remarks upon the nature and influence of the surfaces of bodies, when applied to their heating or cooling, or what is vaguely called their conducting power or property, designedly to attract notice to a subject of such public importance. In the warmer climates, the cotton should very generally be preferred: occasional exceptions may, in some peculiar examples and situations, be proper, nevertheless, the general doctrine formerly inculcated will continue in harmony with nature's apparent original intentions. The cotton is principally produced in those countries betwixt, or at least bordering on the tropics. In these regions, the natives require nothing possessing a greater power of retaining heat, or which conducts caloric more slowly or less powerfully. In the daytime they would require coverings chiefly to exclude its entrance, and in the night as preventive of its avolation; but, as formerly observed, their surface, most probably, has a wonderful influence in modifying and regulating their temperature. Wool is a natural product of the countries extending from 40° to 60° of southern or northern latitudes, and, in these territories, woollen garments have been generally employed from time immemorial. Clothing, made of this substance, was an article of common raiment amongst the ancient Greeks and Romans. In the scorching climate of Ægypt, linen appears to have been a principal material in clothing. Cotton was imported into Arabia, Ægypt, &c. and silk was brought overland from the country which the Sêres, that is, most probably, the Chinese, inhabited. These, when first introduced into the Roman Empire, on account of their dearth, were in use only by the luxurious and opulent, and became the distinguishing habiliments of the voluptuous and magnificent.

LXX. And in the horrific countries, Siberia, for example, Greenland, Labrador, &c. the natural fur-clad teguments of different animals, by a transfer of property, are employed by man for protection against the excessive diminution of temperature. By a proportionate comparison of the warmth commonly experienced at sea, in tropical latitudes, and that to which sailors may be subjected in others, with all their varieties and degrees of warmth, or its opposite, rules for the management of clothing of individuals will be sufficiently perceptible. "Contrarium est quod positum in genere diverso, ab eodem, cui contrarium esse dicitur, plurimum distat: ut frigus calori," &c. A reasonable conclusion may be instituted upon the forementioned observations, that the cotton clothing is generally sufficient for the healthy, in the warmer climates, and may undoubtedly be considered both the most comfortable and commodious. The woollen garments, again, may be admitted in the colder regions, and in the winter, &c. of the variable latitudes. In particular states of constitution, it may sometimes be proper commonly to wear flannel in proximity to the surface; but unless the thermometer should suddenly drop below 70°, or the mutableness of the temperature be very considerable, this will seldom be requisite. When they are deemed useful or necessary, the common mode of using them is highly objectionable. They are generally worn until they are charged with filth in an offensive degree; and this surely must be unpleasant and detrimental to the employer. These articles of clothing should be properly cleansed, and those who use them should have a sufficient number of changes for that purpose. After flannel has been for some time used, caution is required in effecting any material alterations. This becomes a curious subject of attention with those who employ flannel during a British winter, but who, perhaps, adventure to depose it in the summer. In the British channel, and other northern situations, where sailors are exposed to much coldness and dampness, the use of flannel, either next the skin or above cotton shirts, may be adviseable —and in some frail constitutions should not be neglected. Moisture, with cold, is always more powerful in doing mischief to the human frame, than cold simply considered. Jackets, which are rendered capable of resisting the ingression of any humidity, will frequently be adviseable; and in all dampish weather, or where seamen may be exposed, in the night, to heavy dews, this kind of defence will be singularly beneficial. But so much hath already been said on the atmosphere, and in the foregoing part of this chapter, that lengthened discussion seems unnecessary.

LXXI. In voyages of departure which commence in winter, or cold weather, in destinations to the inflammatory latitudes, the alteration of the quantities of clothing should not be hastily performed. Prudent attention to this may prevent a number of disorders, or even ills of a less definite character; and this general advice, likeways, applies to the spring, or vernal seasons, of those countries which are commonly so variable. And it is, moreover, as already hinted, highly proper in returning from foreign voyages, especially when the arrival happens in winter, or the colder months, to be suitably and adequately prepared against the naturally occurring decrement of temperature. This appears to be a precaution of particular importance when the natives of India constitute any part of a ship's company: and similar remarks may be applied to the Chinese, but seemingly not in such an extensive proportion. Those commonly employed in the Indiamen have been previously accustomed to much diversity of temperature; and what seems another advantage, they ordinarily have more hardihood and durability than any other of the eastern natives employed for the purposes of navigation; and are, almost invariably, more ingeniously and sufficiently prepared for diminutions of temperature. The unhappy creatures commonly styled lascars, as already observed, and who are the seamen employed in the country ships, require, when brought to Europe, much attention,—and are, if not properly protected by clothing, suitably furnished with alimentary supplies, and a necessary allowance of good water, peculiarly liable to distempers. The practitioner who has not been accustomed to the treatment of their diseases, must manage attentively and cautiously, for oftentimes they are easily killed or cured, even when, previously, their complaints appeared to be of no importance. These people have all been habituated to a comparatively high temperature, and, for the most part, without the precaution of general coverings for the body, only employing their femoralia and langooty. This is the condition of matters while they remain in their native country, and after embarcation, unless they have been instructed by experience, which is here not necessarily presupposed, they are altogether unacquainted with the vicissitudes to which they may be subjected during the passage. This subject has hitherto seldom received sufficient attention, and these wretches, after forsaking their native country, have been frequently obnoxious to calamity, distress, and unseasonable destruction.

LXXII. If merchant ships must carry these pitiable animals from their own shores, a necessary precaution is here proposed, that they be duly furnished with the suitable garments, and these, likeways, in adequate proportion to their necessities. The woollen coverings will even become necessary, and, in the colder weather, they generally seem highly gratified with such garments. This is exemplified even in their native country, by the delight they seem to take in obtaining a woollen coat, (even a soldier's cast coat,) when they consider the weather to be rather cooler than ordinary. Proper bedding, also, in these voyages, is often not furnished, or is, at least, in many respects, defective. These privations, in conformity to the original and natural condition of these people, may be tolerated while they continue in moderate weather, but, when it is differently qualified, are to them peculiarly inimical, and not uncommonly desolating. The genuineness of these animadversions has to many been demonstrated in rounding the Cape of Good Hope, or in the colder weather on approaching the confines of Britain. The Europeans also, who have wilfully and carelessly squandered or destroyed their apparel, as formerly and repeatedly observed, are commonly the most worthless, hopeless, and abandoned of the human race; and an amendment of their dispositions must necessarily be in precedence to an improvement of their character and behaviour. These observations may appear, to the presumptuous and self-sufficient, to be superfluous and uninteresting, and, more particularly, as this business has previously been, occasionally, the theme of rhapsodical composition. It may here be observed, and which relates to a circumstance which the marine surgeon must have often painfully witnessed, that it is often the most undeserving and the least serviceable, who are most frequently complaining, and the most troublesome; and this occurrence may easily be comprehended from some of the circumstances aforementioned.

LXXIII. The subjects of discussion, in this chapter, are especially interesting, both in the natural history of man, and also in his preservation; but, in obedience to the original intention, these observations apply particularly to the seafaring. In many regions of the earth, the very temporal existence of mankind depends upon a suitable defence from the destructive operation of diminished temperature. Although the inhabitants of Great Britain, in former ages, could, even without clothing, endure the severe vicissitudes of this climate, with obstinate and almost invincible hardihood, yet the state of things has long been changed, and the words "tempora mutantur et nos mutamur in illis," were never more legitimately applicable. If the inhabitants of Britannia were now to attempt to spend the colder months without clothing, it is not improbable, that half the nation would be exterminated in one hibernal revolution. How much destruction is every year committed, amongst the poorer classes, from want of food, clothing, firing, and comfortable accommodation, is too notorious and generally understood to require any illustration. The same conclusion, in a modified degree, applies to the seafaring, but not so much to the soldiery, who are under more particular and preservative administration. The want of suitable bedding, &c. and improper exposure, likeways increase the annual lists of mortality, not only in private life, but in the public services, and amongst the seafaring especially. Although soldiers may be exposed to nocturnal watchings and severe cold, yet, strictly speaking, their circumstances are rarely so uncomfortable as those of sailors, in all their diversified exposure and concomitant irregularities. These circumstances should be kept in view in the management of sailors, for, by the continual operation of these things to which they are exposed, and with which they are surrounded, the natural span of their existence would seem to be abbreviated. Much more might have been said on their exposure, but enough has been proposed to explain the general nature of this interesting subject, and to form measures of prophylactical administration.

LXXIV. The conclusions of these reflections, concerning this part of this undertaking, may be summed up in the few following short aphorisms. 1. That sufficient attention be bestowed upon the nature, quality, and quantity of the clothing designed for seamen, conformably to the uncertainty and mutability of atmospheric temperature. 2. That, in tropical climates, with the exceptions already signified, and which must be partly regulated by the particular necessities of individuals, and the counsel of the intelligent practitioner, cotton clothing should generally be preferred in all situations and seasons where the temperature is above 70° of Fahrenheit, with the requisite attention to its cleanness. 3. That the head covers possess the two desireable properties of sufficiently defending this important part of the human frame, from the hurtful influence of a vertical sun, and also the eyes from the immediate incidence of his powerful lumination. 4. That seamen should commonly employ shoes and cotton stockings, even in tropical climates, and that the pantaloons be gently secured around the ancles; and the lighter colours, in the present state of knowledge, on the influence of different substances in conducting or radiating heat, always to be preferred in the regions aforesaid. 5. That the woollen garments are adviseable in the occasionally temperate, but naturally variable and colder latitudes, and which are certainly necessary in the coldest northern or southern climates, and modifiable, in quantity, agreeably to the occurrence of circumstances. 6. That a watchful attention be paid to changes of clothing in any remarkable vicissitudes of the weather, for which the peculiarities of individuals must prescribe and regulate the instructions and precautions, in conformity to the special condition of their respective constitutions. 7. That, in general, even in the colder regions, they should use cotton shirts, or cotton and lint mixed, and the woollen garments uppermost and outermost. The custom of wearing flannel next the surface, often leads to effeminacy and the indulgence of dirtiness. 8. That the men should be properly furnished with clothes, suited to the climates, or regions, in which they may be occupied, as may be gathered from the short hints foregoing; they should also be rigidly prevented from losing or disposing of their clothes, and should, for every article they receive, be made strictly accountable.

LXXV. As the subject of clothing, and its suitable adjustment, agreeably to the nature of situations and climates, and also the necessities of individuals, not only in a sea life, but as subsisting upon the terrestrial superfice, is a consideration of uncommon interest, some additional observations and instructions upon it, as more immediately applicable to travellers and adventives in tropical and other unkindly climates, may not altogether be unnecessary. This, therefore, constitutes the third division of the general subject, and is of importance, especially to those who may not have previously been accustomed to tropical climates, or the importunate mutabilities of temperature. The British, actuated by an adventurous disposition, fearlessly disseminate themselves into different regions of the habitable surface. They, in the course of their peregrinations, are thus unavoidably exposed to an unaccountable variableness of circumstances, from the extremely rigorous frigorific gripe of northern and southern regions, to the scorching solar blaze of tropical climates; which conditions and changes have thus been poetically and graphically described:

What art thou, frost? and whence thy keen stores
Deriv'd, thou secret all-invading power!—

From pole to pole the rigid influence falls,
Through the still night, incessant, heavy, strong,
And seizes Nature fast. It freezes on;
Till morn, late rising o'er the drooping world,
Lifts her pale eye unjoyous. Then appears
The various labour of the silent night:
But what is this? Our infant Winter sinks,
Divested of his grandeur, should our eye
Astonish'd, shoot into the Frigid Zone,
Where, for relentless months, continual Night
Holds, o'er the glittering waste, her starry reign.

'Tis raging Noon; and vertical the Sun
Darts on the head direct his forceful rays.
O'er heaven and earth, far as the ranging eye
Can sweep, a dazzling deluge reigns; and all
From pole to pole is undistinguish'd blaze.

All-conquering Heat! oh intermit thy wrath;
And on my throbbing temples potent thus
Beam not so fierce. Incessant still you flow,
And still another fervent flood succeeds,
Pour'd on the head profuse.———

Now come bold Fancy, spread a daring flight,
And view the wonders of the Torrid Zone:
Climes unrelenting! with whose rage compar'd
Yon blaze is feeble, and yon skies are cool.

LXXVI. All that appeared requisite to the assistance and information of the seafaring, on the article of clothing, has been previously communicated, and the regulations, if judiciously applied, conformably to the nature and importance of occurrences, will be found to be particularly advantageous. And here it may be remarked, that the same general principles which should constitute the groundwork of seamen's observance, are, *mutatis mutandis*, applicable to those, who are only transiently liable to a similitude of exposure in their circumstances, while travelling to distant settlements. The management and proportioning of their clothing, while at sea, amidst the changeableness and inconvenience of marine circumstances, will not require any more elucidation. On the main ocean, in voyaging to the East Indies, for instance, the changes of temperature are seldom either so sudden or so important as those at land. In proceeding from Britain, the augmentation of temperature (nisi navigatio fuerit velocissima,) will commonly be rather gradually introduced; and, after arriving in the tropical latitudes, the difference of heat will not be considerable. And, in these circumstances, the exhortations and instructions, already delivered, with regard to the atmosphere, dietetical allowances, cleanliness, &c. will, to them, be considerations of tantamount importance.

LXXVII. The British proceed into foreign and distant countries for different purposes; but commonly, discovery, or the exploration of regions unknown, belligerent enterprises, and to which may be added, commercial speculations, are the most remarkable. In these undertakings, how troublesome soever or adventurous they may be, they ordinarily are circumscribed only by impossibility. The most distant accessible portions of the dreadful aqueous expanse, and the most inhospitable of the terrestrial superfice, have also not intimidated them from these hazardous proceedings, although sometimes apparently impracticable. But this is not all; the inquisitive and persevering Briton has not only traversed these wilds and wastes, he has, moreover, attempted settlements even in situations the most disagreeable and unpropitious. Neither the cold of the inclement, nor the heat of the scorching latitudes, have been sufficient to awe his daring front, or countermand his bold peregrinations. The natives of Britain may be found inhabiting different territories, from those in which the winter cold may cause the thermometer to descend to 0°, or even considerably below this point; or contrarily, where the solar heat may raise it to 120°, &c. when the instrument is in unrestrained exposition. But as enough has been suggested on these subjects, when treating of the atmosphere, any additional reflections here would seem to be unnecessary.

LXXVIII. In these materially different circumstances of physical exposure, the convenient and proportional employment of appareling and bedclothes, &c. would appear considerations of very extensive importance. But, even in the warmest climates, as some difference subsists betwixt the diurnal and nocturnal temperature, so, likeways, the observance of this alternating discrepancy should never be altogether disregarded. The illustrations, already propounded, have a principal reference to seafaring persons, and, consequently, are more especially applicable to such, either while at sea, or when they are in contiguity with the marginal boundaries of different countries, islands, &c. and may thus be affected by an interchange of marine and terrene circumstances.—Many forsake their country with the intention of becoming residents in tropical or other climates, in which they are obnoxious to such occurrences, and which, in all probability, they may not have antecedently experienced. In India, for example, in most situations near the coast, they are exposed to a diurnal and nocturnal alternation of temperature, in combination with an interchange of atmospheric commovement: they are subjected to the influence of the land and sea breezes alternately. But this vicissitude does not apply exclusively to the maritime districts; these mutations, in a greater or smaller degree, occur in other situations, so that a knowledge of particular places will not be universally applicable. The variableness of temperature may, in some situations, be considerable; the day may have been blazing hot, but this passes away, and the vespertine coolness, or nocturnal chillness, or even sometimes to the feelings, coldness approaches. An adventive, perhaps, just imported from a cooler country, from ceremony, may wear his heavy European garments, even in the solar warmth of the preceding day, but, after perspiring copiously, he is rendered very susceptible of the influence of the nocturnal refrigeration.

LXXIX. If, in the course of the day, he had worn light cotton or nankeen clothes, and, when the evening arrived, he had considerately defended himself with more substantial apparel, or adopted the Chinese method of assuming additional folds, conformably to their respective necessities, he would thus have employed a rational plan both for his own comfort and protection. This appears to be a hurtful mistake amongst those not accustomed to the variable influence of these climates, as previously explained. Being enwrapped in thick heavy coats, when the thermometer perhaps stands, even under coverture, at 90°, 96°, &c. in the daytime, they are literally seethed in their own moisture; and thus, their sensibility to any contingent diminution of temperature is augmented considerably. If their management were more conformable to the nature of the climate, and the accompanying circumstances, there would be less probability of the supervention of any inconvenience from their imprudence and inconsistency. In this manner, how many young men (for such often suffer most severely in the warmer climates, and hence the woeful mortality which happens in some regiments fabricated chiefly of young fellows!) are annually proceeding to the East or West Indies, with the intention of joining the army, or other purposes. They forsake their native country, animated with the prospects set before them, which are too frequently delusive and infertile; as soon, however, as they enter a burning climate, they soon perceive that it is widely different from their native country, and they begin to experience, unexpectedly, disagreeable annoyances. The overpowering operation of heat is, not uncommonly, one of the most troublesome circumstances. At this stadium of progression, inquiry is perhaps made, if India is still warmer? and the answer, as may be supposed, generally represents the necessity of a still more intolerable aggravation. And, as previously and repeatedly remarked, the influence of custom, in reconciling the sufferance of such occurrences, will be remarkably conspicuous. For example, if a person who has been accustomed to maritime matters, and occasionally exposed to high temperature, should be passenger to an ultramarine destination, &c. he, strengthened and emboldened by his experience, when he hears the youngsters unaccustomed to such circumstances complaining, commonly turns the whole into ridicule, by representing it, but still in prospective anticipation, under the disguisement of exaggeration.

LXXX. It has been formerly observed, that the British part of the soldiery in India is obliged to wear the uncouth woollen garments which are more befitting them in their native country. When it is contemplated, that natives of Britain (however worthless many of them must be considered,) are there stewed and broiled in their own juices, the consideration becomes lamentable. From an unhappy formality, or regulation, they are doomed to use, even in the hottest country, and in the hottest seasons of that country, such garments as have been mentioned: these coverings they must wear, even although the thermometer should stand at 120° in solar exposure. It is not sufficient that the Brito-Indians should be thus burdened; the natives themselves (who are ingeniously, but apparently unnaturally and barbarously, set in organization against their own countrymen,) are condemned to a similitude of imposition. The *native* who, in his *natural* condition, was accustomed to wear his langooty for shielding those parts which even instinctive propensity had dictated the propriety of concealing, and the couverchief, which in the daytime defended his head from solar heat, (which is occasionally, in the nocturnal coolness, employed as a general covering for the purpose of protection,) is likeways consigned to wear the cumbersome woollen garments. In these sultry regions, it is no uncommon thing to see a blackamoor, under the appellation of a seapoy, stiffened up in a coarse coat, the thighs covered with white cotton, and his legs in unreserved exposition, but his feet are commonly shod with sandals. In the broiling influence of the hottest seasons of these climates, every point of his surface is anointed with an oleaginous moisture. At a distance, in the dazzling glare of these regions, the wretched animal thus harnessed, if at the time of observation he is in the position of *attention*, is not dissimilar to some antique figure, or grotesque statue, embrowned by its prolonged exposure to insolation.

LXXXI. A few additional suggestions must suffice on these subjects; but as the prudential adaptation of clothing, according to the necessities of individuals, and the nature of accompanying circumstances, is of vast importance to all who are desirous of the maintenance of their healthiness, sufficient attention to it can never be too particularly recommended. Young gentlemen, as already intimated, going to India to join the army, or to reside for any other purpose, should not expect that they are to be constantly embroiled, both night and day, in an almost insufferable augmentation of temperature. They should be prepared to meet fluctuating modifications, not only in the course of an annual, but in many places in the currency of a diurnal revolution. The possibility, or rather the absolute certainty of these occurrences, should be kept in remembrance; for the difference may sometimes be so remarkable, as properly and necessarily to require adequate precautions; and, undoubtedly, one of these, and one of singular moment, is the judiciously apportioned management of appareling. As an illustration of the occasional difference of diurnal and nocturnal temperature, the following quotation from Dr. Nicoll's Observations on the Climate, &c. commonly prevailing at Seringapatam, may be introduced. "The four first months of the year are excessively hot, close and sultry, until the Malabar monsoon sets in, in May. At 5 in the morning, the thermometer is generally about 65°, and at 3 in the afternoon about 94° of Fahrenheit. In May and June, by the refreshing showers and breezes wafted from the mountains, which separate the Mysoor from the Malabar country, the climate is rendered tolerably healthy and pleasant. Again, it becomes sultry and hot in July, August, and September; but nothing like to the four first months of the year, until the Coromandel monsoon begins in October, which, by its mild and salutary influence, soon affects great and remarkable changes in the air and temperature of the place. At this season, especially in November, the thermometer at 5 A. M. has been so low as 48°, and in the middle of the same day has risen to 88°. I have also frequently observed a difference of 40 degrees between six o'clock in the morning and twelve of the day. During the hot months of the year, the winds are generally southerly or easterly; in the cold season they become westerly or northerly."

LXXXII. From these observations it is demonstrated, that there the difference of temperature, diurnally intervening, is very considerable; being no less than 40° of Fahrenheit. The descent from 94°, for instance, to 65°, will have an important influence upon those obnoxious to its operation. In the course of the discussions on the atmosphere and the article of clothing, the reason of the extensive impression of this alternation of temperature will, in some measure, be understood. A person who has, a few hours before, been exposed to a heat of perhaps 94°, will very sensibly perceive the comparative coolness at 65° of the thermometer. These frequent disparities or inequalities in the heat, would seem to dictate the propriety, and even, at least, occasional necessity, of proportioning the coverings, in conformity to the circumstances. At 3 P. M. for example, one fold of cotton would be sufficient for a covering, and a broad-brimmed and large crowned hat, of the lightest nature, and white colour; but at 5 A. M. the British woollen clothing could be borne with convenience and advantage. It would appear, from an examination or investigation of the movements of the British in India, that they may be exposed either to the calorific influence of the burning plains of Bengal, or to the grievous cold of the Himalaya mountains, implying a difference of perhaps 80° to 100° of discrepance of atmospheric temperature. From all circumstances it is demonstrable, that the Brito-Indians may be, in the course of their perambulations, exposed to even a more extensive range of temperature than in their native country: and what is of essential moment, its fluctuations are happening suddenly, and in quick succession; to which may be added, their comparative extensiveness. And besides the diurnal alterations, or the differences which occur every twenty-four hours, these regions are frequently liable to the influence of the more remarkable interchange of the periodical breezes called monsoons, which commonly blow from five to six months in one course, with occasional but trifling variations. The changes of the seasons from the wet to the dry, and the reverse, are likeways considerations of importance, and particularly to those not accustomed to such remarkable circumstances. In the wettish and deeply rainy seasons, it is often coldish, (comparatively,) and sometimes boisterous, and thus requiring, after the operation of the preceding heat, as much clothing as might suffice in a British winter; and if this is not suitably regarded, diseases of multiform descriptions, and especially of the intestines and collatitious organs, may be the consequences.

LXXXIII. Another observation may be made, and which is a consideration of some weight, that some situations may be tolerably healthy, continuing one monsoon, but when the breeze is reversed, it is sometimes rendered injurious in its properties; but for an account of these circumstances, reference may again be made to Dr. Lind, and others who communicate particular information. The conditions of islands are often different from those of continents; and in these respects the West India islands are somewhat different from the more extended East Indian territories. In a few islands inhabited by the British, Saint Heléna, for instance, the residents are exposed with scarcely any material or important variation to the Trade-wind blowing in the same direction. The general nature of these is more certain than that of those islands which are obnoxious to the breezes which alternate. In some insular situations, a difference of temperature may generally be obtained, and that at no great distance; of these, the last mentioned island, and Puloo Pinang, are natural examples. At Saint Heléna, in James' valley, the thermometer may stand at 84°, and at the same time, at Diana's Peak, perhaps it is not much above 60° of Fahrenheit. At Pinang, a still greater difference is occasionally observeable. These differences of temperature, within the distance of four or five miles, are oftentimes agreeable to valetudinarians and convalescents. The person, likeways, who has been embroiled in the heat of the day, by withdrawing to a little distance in the evening, enjoys the nocturnal coolness for repose, and which is occasionally modifiable by the construction of the sleeping apartments. In these circumstances, a difference in the proportion of clothing, which the state of individuals will dictate, would also be commendable; but with reference to these things, the natives and accustomed residents are so well acquainted, as to supply the necessary information to all adventitious sojourners. Incautious exposure, and especially during sleep, to the nightly coolness, with a defective or inadequate proportion of covering, is in these climates often the cause of mischief. And the consequential inconvenience will be, in some degree, in conformity to the heat, labours, mode of living, &c. of the day preceding, and the accompanying or superinduced state of the constitution.

LXXXIV. When the atmospherical circumstances were under contemplation, it was shortly signified, that European soldiers and others are frequently in unfavourable exposure in oriental, and, it may be conjoined, in occidental countries. In the desultory observations lately suggested on clothing, it was mentioned, that these people are unkindly and hurtfully encumbered with heavy woollen clothes, which must be peculiarly irksome, or even distressing, in all degrees of heat above 60° or 65° of Fahrenheit. At its first imposition it must be unpleasant, even to the natives, who have been naturally and almost constantly accustomed to aggravated temperature. The seapoys, or Indian soldiers, in their natural condition, and the higher heats of their climates, are commonly exposed, even in full solar influence, without any general artificial integuments. In a heat of perhaps 90°, 100°, or even more, how uncomfortable must it be for them to be enveloped in ponderous coarse woollen clothing! This, it is true, applies chiefly to their bodies, for these are the parts which are principally harnessed; the thighs being commonly covered with cotton, and the legs often exposed. Their common, and it may be said natural coverings, are made of cotton; and this is certainly the most proper integuments for them, in the higher degrees of heat in their native country. The woollen coverings may perhaps be allowable, or rather suitable, when the temperature falls below 60° of the thermometer. Attention should also be bestowed upon the occasional differences of clothing, which may be adviseable and beneficial when the natural and diurnal inequality of temperature is taken into consideration. In the blazing heat of the day the cotton garments should be preferred; but perhaps in the night, when people are in exposition, the woollen coverings, or these latter over the cotton, or the cotton tunics increased in proportion to the necessities of individuals, will be commendable. But this is rather a digression from the particular object—the management of the clothing of Europeans when translated into the tropical latitudes. The subject, however, is of importance, in as far as these tawnies constitute a material part, and perhaps the most durable, of the defensive force belonging to the British in Indian territories.

LXXXV. In the West Indian islands a diversity of temperature is ordinarily experienced. This atmosperical changeableness is greatly modified by their insular properties, by the nature of the surface, and other circumstances of particular islands respectively. In the lowlands, the temperature may sometimes be almost insupportable by those unaccustomed, while, in the highlands, it may be comparatively moderate, and, therefore, rather agreeable. These islands have been commonly deemed peculiarly unfriendly to British constitutions. But, as previously illustrated, many of the inconveniencies and misfortunes are accidentally supervenient or mechanically introduced. So much, however, has been already advanced, upon some of these important circumstances, as not to demand much more, or any, additional consideration. Some practical remarks upon clothing, as more immediately applicable to adventives to these and such places, now seem to be sufficient. It has been mentioned that Europeans—but the allusion is more especially made to Britons—frequently upon their arrival, in even the warmest climates, employ their heavy woollen garments, instead of accommodating their clothing proportionately to their new circumstances. This improper submission to formality, upon their first intermixture with the residents in those countries, should certainly not only be considered as unpleasant and unsuitable, but, likeways, as particularly incommodious and progressively prejudicial. An enumeration of all the accompanying inconveniencies and bad consequences of this injudicious management, is deemed, at present, after what has been suggested in various parts of these disquisitions, as inapplicable and superfluous. How often has there been occasion, in these torrifying climates, to observe young fellows, who, upon leaving their native country, were vigorous and healthful, with freshness of countenance and plumpness of constitution, speedily reduced to comparative feebleness, pale countenance, and constitutional slenderness. It is not enough, that the woollen coat be simply and loosely employed; military etiquette requires that it be securely buttoned, and thus the inconvenience is considerably aggravated. By this unfitness in the article of clothing, the person suffers, in these scorching climates, when, perhaps, the thermometer may stand at 80° or 90° even in the shade, and when perspiration is copiously augmented, so that the body seems as if bathed in its own moisture; this profuse emanation from the surface debilitates extensively; intestinal slowness is thus indirectly but greatly favoured or produced, and the whole constitution suffers materially, and destruction of constitutional healthiness is the unavoidable consequence.

LXXXVI. In all climates, therefore, where high heat prevails, it should be a standing ordinance, that light clothing be always used, excepting when the seasons may become variable, or there is a considerable declination of temperature, and heavier garments will then be adviseable. It may here be remarked, that too large a quantity of clothing, in high heat, aggravates all the feelings of uneasiness, and induces much additional irritation, by accumulating more caloric on the surface; or, at least, by detaining the perspired matter upon the body, much annoyance and mischief are frequently thus produced; an irksome sensation is diffused over the whole surface, the affection called prickly heat is excited, or, as occasionally happens, is exasperated in all its circumstances. In many youthful and irritable constitutions, and, especially when unaccustomed, some degree of diurnal febrile excitement is induced by the constant irritations on the surface, and perhaps concomitant exposure to excessive temperature. If the clothing is light, loose, and thin, the superficial transpiration is thus allowed to escape, and, by the uninterrupted evaporation, an agreeable coolness is more readily maintained. In high solar heat, the wideness or looseness of the garments is a consideration of importance; and the advantages of this are often experienced in those parts of the body which are thus kept at a moderate distance from the immediate influence of the solar rays, and those parts upon which the clothes are nearly in contact: these latter are often pained by the operation of the high temperature, while the former are in a comparative state of refrigeration. After this manner, how common is it for people, in the warmer climates, while wearing white jackets, for instance, to feel their shoulders heated, because there the clothes naturally press more closely than in other parts; while those parts which are loosely covered may feel moderately comfortable. The natives of these climates who may employ garments, also commonly wear wide and loose trousers, and of this the Guebres or Parsees are notable examples, by which their inferior extremities are more thoroughly shielded from the solar influence; and when travelling in exposure, the upper parts of their bodies are defended by the ample umbrellæ, which are so generally used in those countries. This accommodation of their dress would appear to be one reason why the Αὐτόχϑονες, or indigenous inhabitants, endure the influence of undue heat better than the adventive Europeans. These reflections would seem to lead to this conclusion, as indeed is rationally established from *immediate* observation and experience, that such light and loose garments should commonly be employed in all the warmer climates. If soldiers, therefore, in some of their marchings, in scorching climates, were to be furnished with loose cloaks, (the sagum or chlamys of the ancient Romans,) they would thus be defended from much inconvenience; and, in an especial manner, if their heads were suitably protected, the probability of their safety would hereby be much strengthened. In the violent movements which soldiers are occasionally forced to undertake, the circulation is often greatly accelerated, and augmented in strength, and they are thus, not unfrequently, cut off by some violent complaint almost instantaneously.

LXXXVII. Military, when occupied in nightly watchings, could conveniently defend themselves with woollen cloaks—the gausapa of the Roman soldiery; the gausapina pœnula of Martial—or other suitable garments, proportioned to the necessities of individuals. As may sufficiently be understood from the principal disposition of these notifications, the employment of too much clothing would seem to be manifestly prejudicial to strangers, and especially upon their first settling in the warmer climates. It has been, in the course of the preceding discussions, repeatedly observed, that some change is effected in the general condition of the constitution by a continued residence in, and exposition to, particular circumstances, by which the body would seem to acquire an additionally communicated qualification of withstanding the operation of these circumstances. It is, moreover, as already remarked, observeable, that those who have resided for a length of time in the warmer climates, are gradually enabled to tolerate a heavier or larger quantity of clothing, and which will, comparatively, give less inconvenience in high temperature. This circumstance is not mentioned as a regulating consideration, that because an increased quantity of clothing *can be* used with apparently less disadvantage, the plan of gradually augmenting the proportion is to be recommended. It is extremely probable, that many get into the custom of wearing a larger quantity of garments than requisite. This has been ascertained by autoptical observation; some have been seen with thick cloth pantaloons, and boots, and every article of clothing in proportion, even in 80° or more of temperature. This is, undoubtedly, an unreasonable allowance; and although some may bear such an unnecessary accumulation of habiliments with indifference, or even without inconvenience, nevertheless, the probable conclusion is, that it is sooner or later prejudicial to most constitutions. Some of these considerations should constitute inducements to an improved regulation of clothing, as applicable to the Public Services, in the warmer climates particularly. An unnecessary and exhausting load of garments must, at all times, in high temperature, be singularly unfavourable; and, either more immediately or indirectly, speedily or more slowly, be productive of multifarious disagreeable consequences. Among military and seamen, who are commonly so extensively exposed in active times, these animadversions are unconditionally appropriate.

LXXXVIII. After soldiers or sailors have been either marching or labouring severely, it is naturally to be expected that they will have perspired copiously; and as frequently happens among some of these, the sailors, for instance, especially, little clothing has most likely been used during their exertions; and thus, when their undertakings are interrupted, or when they pass into a quiescent condition, they are in a fit state for rapid refrigeration. Mischief has often been incurred by these careless people in such circumstances: instead, therefore, of being cooled suddenly, they should, by suitable management of their coverings, take care that their cooling is gradually and cautiously accomplished. From some of the foregoing statements it must be perceived, that soldiers, even under the forceful solar influence, are commonly inwrapped in woollen garments, by which perspiration is extensively augmented; and from the closeness and thickness of their habiliments, their own moisture is longer retained upon the surface. Soldiers, when in an irritated and irksome condition, are naturally inclined, as soon as they can do it with impunity, from the operation of military formality and injunction, to unshackle themselves from the wearisome constriction of their harnessings. They open their clothes, and thus they often are cooled suddenly and untimely; the consequences of which may be manifold and important. The consequences will, in all probability, be still more prejudicial if they expose themselves in a current of air, or if the vespertine coolness has set in during the act of superficial refrigeration. If, instead of this imprudent exposure, they were so to proportion their quantities of coverings, as to allow the cooling process to advance without the introduction of any perceptible inconvenience, much evil might easily be prevented. In India, how many have thus been unfitted for service, for a length of time, by the occurrence of diversified complaints, and modifications of indisposition. But the enumeration of these (and a multiplicity of other circumstances,) would lead into the natural history of diseases, their varieties, prevention, treatment, &c. some of which are not directly the intention of these already unexpectedly extensive, and, confessedly, perhaps rather immethodical disquisitions.

LXXXIX. It is almost unnecessary to mention, that in the warmer seasons of most countries, but especially of the tropical, that frequent changes of the clothes or coverings next the surface, will be not only agreeable, but necessary. The cleanness and dryness of the garments in immediate contiguity with the surface, will constitute a luxury, which can be recognized by those only who have experienced the uneasiness of sweltering in high temperature. From the annoyance excited by using heavy garments in the warmer climates, the propriety of employing light cotton clothing will be the more conspicuous and gratefully acknowledged. It is not unusual for the residents in these climes to change their shirt, &c. twice a day; and in the hotter season it will commonly be necessary to put on a clean shirt every morning. There is, likeways, a propriety in changing the shirt which has been used in the day, for another, clean and dry, destined for the purpose of sleeping. This practice is adviseable in all situations, but especially in the tropical, where, after the fatigues of a broiling day, and the coverings next the skin bathed with sweat, the employment of a clean fresh covering next the surface will be highly agreeable, and may be the means of procuring sleep, which, without this expedient, might not be speedily obtainable. It will also be necessary, that all those clothes which come next the surface should have been made perfectly free from any irritating substance, which may have been used in washing, otherways it may produce some itching or other uneasiness, or even some eruption on the surface. The clothes should, therefore, be carefully rinsed with clear water before drying. It is not improbable, that although the coverings next the surface should be slightly charged with soap, it will rather be beneficial than prejudicial; but this would apply to fine or pure soap only, and as this article is seldom prepared from such pure materials as to be wholly inoffensive to the surface, the foregoing advice, of having the clothes completely freed from any saponaceous impregnations, will generally be applicable. The surface, in high heat, in foreign countries, sometimes becomes extremely irritable; so that the slightest cause will occasionally, and in particular constitutions, excite considerable uneasiness, and frequently cutaneous eruptions of different descriptions. This superficial uneasiness is sometimes produced by too much scrubbing and washing of the surface, and is then the consequence of officiousness. But commonly, those who live in unchastened dirtiness, suffer most from the natural excretions of the surface being allowed to accumulate, and from the nastiness of their habiliments.

Vela damus vastumque cavâ trabê currimus æquor,
Postquam altum tenuere rates, nec jam amplius ullæ
Apparent terræ, cœlum undiquè, undiquè pontus:
Tum mihi cœruleus supra caput astitit imber,
Noctem hyememque ferens: et inhorruit unda tenebris.
Continùo venti volvunt mare, magnaque surgunt
Æquora: dispersi jactamur gurgite vasto:
Involvere diem nimbi, et nox humida cœlum
Abstulit: ingeminant abruptis nubibus ignes.
Excutimur cursu, et cœcis erramus in undis.
Ipse diem noctemque negat discernere cœlo,
Nec meminisse viæ mediâ Palinurus in undâ.—
Tollimur in cœlum curvato gurgite, et iidem
Subductâ ad manes imos descendimus undâ.—
Hic steterat nautis olim venerabile lignum,
Servati ex undis ubi figere dona solebant
Laurenti Divo, et votas suspendere vestes.

CHAPTER FIFTH.

REFLECTIONS ON CLEANLINESS AND ACCOMMODATION, AS APPLICABLE TO THE SEAFARING; AND MISCELLANEOUS ILLUSTRATIONS OF PROPHYLACTIC ADMINISTRATION; OBSERVATIONS ON VENTILATION, FUMIGATION, &c. AND THEIR CONSEQUENTIAL ADVANTAGES, &c. &c.

I. AMONGST mankind in a state of civilization and cultivation, exclusively of artificially introduced and less important, and, perhaps, prejudicial refinements, the three aforementioned super-eminent considerations demonstrate themselves to be unconditionally indispensable. A fourth and consecutive circumstance may be legitimately propounded, as particularly applicable to the human species, and contributive to their healthiness and happiness; and that is cleanliness. By the appellation cleanliness may be understood, the operative performance requisite for the abstergement of filthiness or nastiness, and, consequently, the introduction of cleanness. Or, in a shorter and plainer definition, cleanliness is the practical act for the removal of impurity; and it sometimes seems to be expressive of the state thus superinduced. As great a difference of import subsists betwixt the words cleanliness and cleanness, as between lavatio and lautitia, or mundatio and munditia; the genuine meaning of which terms the philological practitioner will immediately comprehend. Personal cleanness, for the preservation of healthiness, will not alone be sufficient; it must comprise all the objects necessarily interested in their accommodation. The importance of this department of these animadversions, is demonstrated by every day's observation; the difference of the comfort and happiness of those provided with all the necessaries calculated for maintaining both their immediate cleanness, and that of all their appertenances, is continually manifested even to superficial observation.

II. The conceivable consequence, or rather instant effect of cleanliness, is the removal of foulness or dirtiness, with all its disagreeable appearances and prejudicial circumstances. And thus cleanness, abstractly understood, is a superinduced qualification; and also necessarily presupposes a preceding act of purification. Cleanness, then, is a qualification or state, possessing properties, or displaying phænomena, completely opposite to those of nastiness. The propriety, advantage, and even necessity of cleanliness, and therefore the obtainment of its beneficial consequences, were seasonably apprehended. The performance of washings, ablutions, &c. was commonly observed among even the most ancient nations; and those parts of the body most exposed to defilement are often mentioned, as the subjects of lavation and purification. The supplying of water for cleansing the inferior extremities of the way-worn traveller, was acknowledged as a particular demonstration of kindness and hospitality. "Let a little water, I pray you, be fetched, and wash your feet, and rest yourselves under the tree." The Orientals were wont to wash the feet of strangers who came off a journey, because they commonly walked with their legs naked, and their feet only defended with sandals. "And the man came into the house: and he ungirded his camels, and gave straw and provender for the camels, and water to wash his feet, and the men's feet that were with him."—"And the man brought the men into Joseph's house, and gave them water, and they washed their feet."—"And she arose and bowed herself on her face to the earth, and said, Behold, let thine handmaid be a servant to wash the feet of the servants of my lord." From this last quotation it would appear, that there were even servants intended for the low office of washing the feet of travellers; and this business is of particular importance in the Oriental world, where the natives are commonly exposed with only sandals on the soles of their feet, whereby they are subjected to the dust in the course of their travelling.

III. In the warmer climates, the first habitations of man, the frequent recourse to the act of washing, when seasonably performed, would produce the most grateful sensations and pleasant influence. The advantages obtainable from this performance were considered to be of such remarkable importance, that the observance of frequent ablutions, and washings, and immersions, &c. became sanctioned by religious ordination and injunction. And thus, in the primitive conditions of mankind, cleanliness, with its acceptable correlative, cleanness, were thus suggested for their approbation and employment, and progressively recommended to indefeasible performance by the interference of preceptive appointment. And herewith an advantageous circumstance was established, which, otherways, might probably not have been instituted, or which certainly would not have been conformable to regularity. The observance and performance of bathings, washings, &c. have, in all ages, been more attentively regarded amongst the natives or inhabitants of the warmer climates. The Greeks and the Romans, the two most polished of ancient nations, were examples of the frequent attention to ablutions, immersions, swimmings, &c. Although bathing afterwards became the subject of improper application, yet, if becomingly and discreetly conducted, would have been of continual propriety and usefulness. The impropriety in reference, consisted not in its original condition and circumstances, but in subsequently introduced degradation, mismanagement, and the dishonourable unsuitableness of its application. Swimming was one of their customary amusements, and this was powerfully favourable to the maintenance of healthiness, cleanness, robustness, and adroitness. This exercise, properly performed, would be wonderfully conducive to their advantage; for hereby their strength was supported, and vigorous attempts performed with unwonted facility and expedition. The flouncing and variegated evolutions and clashings in the watery liquid, answered in some measure the purposes of the strigilis, (the ancient Roman scraper or curry-comb, generally composed of horn or brass, sometimes of silver or gold,) which they used for rubbing off sweat and filth from the surface. The comfortable advantages deriveable from the circumspect and opportune employment of swimming, bathing, &c. would also recommend the continuation of its performance.

IV. The advantages obtainable from cleanliness suggested the propriety of constructing the balineæ publicæ, which, as lately hinted, afterwards underwent a perversion from their primitive and beneficial, to disgraceful and abominable, purposes. Although, amongst the generations of many years antecedent and proximate to the present century, in civilized countries, the practice of bathing be less observeable, the application of it, however, continues in different parts of the world, and especially in those tropical latitudes, whose inhabitants may still be considered as in a state of barbarity or rudeness. In these regions, the observance of swimming, washing, ablution, &c. is still, from ceremonious principles, continued. And here it is, perhaps, not undeserving of notification, that the ceremonial of frequent aspersions and ablutions, as prescribed by the impostor Mahomed, and other execrable Eastern heresiarchs, have been nearly as productive of advantage to their corporeal, as their unhallowed and audacious doctrines, and blasphemous instructions, have been injurious to their spiritual happiness. Although the spell of the damnable imposition might be supposed to be now in a state of dissolution, yet these misguided creatures have hitherto been implicitly obsequious to all the fraudulent commands and instructions. The Asiatics, among whom may be enumerated the Persees or Parsees, the Arabians, the Gentûs, the Hindûs, &c. are all in possession of particular regulations and informations concerning the propriety of abstinence, and the necessity of numerous cleansings. Deceitfulness, and dissimulated sanctimony and superstition, originally instituted ceremonious ordinations, which have thus unexpectedly been serviceable in the preservation of their healthiness. Practical observance, once in a state of confirmation, and traditionally and successively communicated to following generations, and strengthened by an imitative obedience to the instructions of the impostor, acquiescence thus became perfect in uninterrupted accomplishment.

v. An instinctive disposition, most probably, would instigate mankind to cleanliness. The advantages therefrom obtainable, would demonstrate to them the useful and acceptable consequences of continual attention to the preservation of cleanness, and the prevention of whatever might be loathsome from its foulness. Two remarkable considerations may have primitively and principally acted in the introduction and continuation of cleanliness,—the suitableness and requisiteness of removing whatever was incovenient or troublesome, either on account of its unseemliness and irksomeness; or the disagreeably and offensively destructive consequences of perpetually subsisting nastiness. The very irrational creatures would exemplify or illustrate to man, perhaps otherways inattentive, the beneficial performance of purification, conformably to methods relatively applicable to their several natures, conditions, situations, &c. Plunging or immersing in the limpid rivulet or current, was probably the original mode of general ablution. This is commonly the practice of unpolished nations, and the barbarous inhabitants of different islands. Amongst these it is a simple process ; the washing and scouring of their own bodies forming a part of their diurnal occupations. As they commonly live without regular garments, and recline on matting, or the verdant surface, the cleansing of apparel is, with them, a circumstance scarcely demanding attention. These observations are more immediately applicable to the inhabitants of the latitudes included by the tropical boundaries, and in the warmer seasons of the regions which are contiguous

VI. Projecting an imaginary glance upon the miserable inhabitants of the territories which are commonly exposed to the influence of severe cold, there will be discoverable the most uncourteous and forlorn of mankind. In these inhospitable regions, uncleanness very constantly predominates; and this may be caused by the superlative inconvenience of the continually prevailing intemperature. There the cumbersome habiliments of the natives are almost unceasingly in employment, as long as they are considered fit to be continued for defensive purposes. The commendable qualification of cleanliness constitutes a little proportion of their artificially attainable happiness. This unrestrained and abominable accumulation of filthiness is, fortunately, amongst them, not so immediately productive of inconvenience and prejudicial consequences, as it would be to the inhabitants of intertropical latitudes. But this conclusion does not constitute a negative argument against the progressive application of cleanliness, and the employment of every kind of purification indispensable to its obtainment. Those nations, or even those individuals, who constantly observe the requisite attention to the preservation of cleanness, ordinarily procure to themselves, *cæteris paribus*, a greater degree of comfort and health, than those do, who perpetually wallow in detestable filthiness.

VII. In the warmer climates, the advantages deriveable from cleanliness are particularly conspicuous, and are still more impressively remarkable, when the miserable and uncleaned habitations of the destitute are brought into comparison with those of the affluent and luxurious. This proposition, indeed, will commonly be applicable in all the habitable parts of the terrestrial superficies. It would be comfortable and serviceable, if the natives of the warmer climates bestowed as much attention to domestic cleanness as to their corporeal cleansings and ablutions; but this inference is not to them exclusively applicable. Cleanliness is, in all regions and situations, extremely requisite and beneficial; its legitimate consequence, cleanness, is of incalculable importance in the maintenance of convenience, agreeableness of appearance, and, what surpasses all other considerations, in the preservation of healthiness. In some particular departments, cleanliness is happily established, and regularly performable, by the interference of constituted authority; and the benefits thus received thoroughly confirm the propriety of its application and continuance. As just hinted, an examination of the dwellings of the necessitous and inattentive, in which foulness holds its most loathsome and disgustful sway, with all its mischievous consequences, consisting in an extensive and disagreeable variegation of distempered derangement in the body, and either generally or topically remarkable, will furnish an irrefragable proof of the correctness of these reflections.

> "Mundus erit, qui non offendet sordibus atque
> In neutram partem cultûs miser."———
>
> ———"Ne turpe toral; ne sordida mappa
> Corruget nares."

——" contactûque ommia fœdant
Immundo."——

——,' atque immundus olentia sudor
Membra sequebatur."——

——" barba pædore horrida,
Atque intonsa infuscat pectus illuvie scabrum."

" Obsita erat squalore vestis, fœdior corporis habitus pallore ac macie perempti."

VIII. If these considerations and statements, respecting the usefulness and gracefulness so cheaply obtained by the maintenance of cleanliness, be conclusive, with regard to people enjoying their natural freedom, and every opportunity of preserving themselves in a state of cleanness, how much more emphatically, and perpetually commendable and appropriate, to those who are constrained and compacted within a ship's determinate boundaries. Every day presents to the observation of the discriminating, the mournful difference of the person who is under the unwholesome dominion of slovenliness, and of the one who is actuated by the principles which lead to cleanliness. The first is frequently noisome to himself, and commonly offensive to the enlightened beholder; but the latter is generally comfortable in his own feelings, and presents that comeliness of appearance which is always so commendable and acceptable. These prelusive and prefatory remarks being propounded, a more particular examination of the subject will be necessary. Particular arrangement is here, apparently, almost superfluous, and is at least difficultly obtainable, where, from the promiscuous and changeable nature of circumstances, illustrative classification is nearly impossible. The elucidation of the business, as far as conveniently practicable, may run thus: 1st Cleanliness. considered as personally employed, inclusive of corporeal cleanness, and of wearing apparel, and of bedclothes, &c. 2nd. As applicable to habitations or places of abode; and in reference to the seafaring, these observations are more immediately suited to the circumstances of those dwelling on shipboard.

IX. Agreeably, therefore, to proposal, cleanliness as applicable to seamen, with their more immediate appertenances, becomes the first subject for discussion. And this, by all experienced, and those sufficiently acquainted with marine affairs, will be considered as comprehending considerations of remarkable importance. Athough people were placed in the healthiest territories of the mundane surface, and in possession of all other advantageous circumstances excepting *cleanliness*, every other comfort would thereby be importantly diminished. This inattention to, or disregard of, the maintenance of cleanliness, however, in the confinement and other unfavourable circumstances on shipboard, would be productive of still more disagreeable inconveniencies. And this is particularly exemplified amongst those who continually live in filthiness, and the commendable few who spontaneously keep a state of comfortable cleanness; and if these circumstances be remarkable in all seasons and climates, they are still more so in those of the tropical latitudes.

X. As cleanliness is powerfully subservient to the preservation of healthiness, in every situation in which mankind may either naturally or accidentally be exposed, so it becomes more especially beneficial on shipboard. Seamen, accustomed to their particular allocations, and naturally possessed of reasonable and benevolent dispositions, will commonly endeavour to keep themselves in a state of cleanness. These commendable and profitable qualifications, however, are confinedly observeable; and, in opposition to one attentive and prudent person, possessing such estimable properties as inclinations to the maintenance of cleanliness, the generality of mankind may be considered as wallowing and overwhelmed in ignorance and laziness, and negligence of a virtuous practice which would be conducive to their ordinary happiness. Encompassed with filthiness from their earliest infancy, they deem amendment an undertaking completely objectionable and irreconcileable. The intelligent and inquisitive superintendant will speedily perceive and distinguish the diversified characters to whom these notifications are professedly and peculiarly applicable. A warrantable distinction, thus judiciously instituted, may afterwards be serviceable in the distribution and management of discipline, adviseable and necessary for particular individuals. The arguments requisite to recommend an unremitted observance of corporeal cleanness, have been already, in some measure, enumerated. The unavailing semblance of attention to it is extremely blameable; proportionate instructions, and conformable acquiescence, will be necessary to establish and maintain its suitable and effectual performance and perpetuated application. The principal obstacles to cleanliness, are the heedlessness and slothfulness of individuals; the unfitness or deficiency of clothing, which latter amongst sailors is so commonly an unfortunate inconvenience; and to these may be added, the inadequate or insufficient instructions and regulations from constituted and responsible authorities. These are imperfections and improprieties which are all remediable, and therefore their prevalence is altogether unpardonable.

XI. Corporeal cleanness must be maintained by the performance of frequent ablutions, cleansings, or washings, &c. Cleanness is particularly requisite to the seafaring in the warmer climates. Besides the common causes of defilement, the different excretions from the cutaneous surface act in conjunction; these remain, in a greater or lesser degree, entangled and embodied in their clothing, bedding, &c. and adherent to themselves. For example, it is no infrequent occurrence for the keen observer to discover their surfaces occupied with an additional incrustation or involucrum of loathsome foulness. "In corporibus incultis, squamosisque alta congerie sordium, squalor appellatur." This grievous coating is often allowed to remain unremoved for months, unless they should undergo an accidental lavation by friendly Nature's refreshing sprinkling. Sometimes, when thus casually exposed, when the weather is tolerably moderate, they are induced to wash their whole bodies; and this, with many being rather an infrequent performance, the circumstance is ostentatiously commemorated or kept in remembrance. In these stubborn and flagitious examples of inattention, uncleanness and degeneration, nothing but forcible abstersion, and this vigorously administered, will be sufficient; and some chastisement will be commendable, and may prove an advantageous application. They are thus entirely without excuse; and, frequently, officers and commanders are highly blameworthy for inattention to the enforcement of cleanliness amongst their ships' companies: and this accusation is peculiarly applicable to those of the vessels occupied in mercantile speculations. The remedy for the removal of the mischief in question is always in a state of plentiful provision, and when needed is conveniently procureable. Sailors are constantly floating in the very liquid, the sufficient employment of which will cleanse them from all external dirtiness.

XII. In all situations betwixt the tropical lineations, and even elsewhere, in a temperate state of the atmosphere, ablution should be properly performed upon the whole of a ship's crew; or, what will commonly be more convenient and applicable, that part of it forming the morning's watch may seasonably enjoy the gratification of doing themselves a kindness by this commendable act of cleanliness. A ship's company, when subdivided into three parties, which, as formerly suggested, and apparently, whenever practicable, the most adviseable plan of procedure, will thus be currently subjected to purification every third morning. And, if they are in two divisions, every second morning's twilight will recommend its performance. The morning will generally be the most suitable time for its application; and in this beneficial proceeding they may mutually assist one another, and thus the work may be both speedily and effectually accomplished. The whole body should be regularly submitted to the operation of cleansing, and hence the consequences will be the more extensively advantageous. The head, the armpits, the breast, the back, the groins, the feet, &c. require particular attention, and must be thoroughly freed of their foulness, in several of which places it is very apt to accumulate. In the armpits, the groins, and along the hollow of the back, &c. the natural exudations are, in the warmer climates, generally copious; and, if allowed to gather unduly, they become very offensive, so that the uncleanly person may commonly be easily discovered when placed to windward. These expurgations and purifications should always be done under the inspection and guidance of a person qualified for determining its suitable management. The operation should be actively and cleverly accomplished: plungings, aspersions, &c. will frequently not be sufficient, the strigilis, or curry-comb, (a little teazed oakum, &c. will answer for a sailor,) must, if necessary, be applied occasionally. A hard brush, or cloth, will at all times be useful, and should upon the dirty and lazy be powerfully and effectually applied. These proceedings once confirmed by repetition, the men will be gradually accustomed to their performance, and become gratefully acquainted with their usefulness. The greater the attention bestowed upon these subjects, the advantages therefrom deriveable, will, in all probability, be proportionate.

XIII. All these suggestions to the gentlemen bustling in mercantile transactions, and those engaged in merchantmen, will appear unnecessary and undeserving of such particular consideration. Accumulated experience, however, demonstrates the propriety of such proposals, or rather their invincible necessity. The neglect of cleanliness in protracted voyages, is absolutely inexcuseable, and deprives the people of a circumstance which may be powerfully preservative of healthiness. A precaution necessary in managing this business, is the avoidance of washings, aspersions, &c. if there is considerable perspiration, and especially if this has been preceded by labour or fatigue. If this circumstance is not sufficiently understood or overlooked, mischievous consequences will sometimes arise from its injudicious or unseasonable application. It is a precaution of importance, therefore, to the men who may be labouring in discharging the holds of trading vessels in warm climates, &c. and where they are liable to be covered with filth, that they do not injure themselves by bathing or washing unseasonably or imprudently. Under these circumstances, the misemployed administration, not the means, is blameable. Suitable vessels should be provided for the purpose of ablutions or washings, and the water changed as frequently as necessary.

XIV. This enlivening, strengthening, and prophylactic application, therefore, should regularly constitute a part of discipline both at sea and in harbour, in the tropical latitudes, and always in the the summer months in other climates. Even in the northern winter it should not be neglected; cleanness must be maintained by the necessary means in every situation and in every season. The poetical description of swimming, with some of its advantages, may here be introduced.

> "This is the purest exercise of health,
> The kind refresher of the summer-heats;
> Nor, when cold Winter keens the brightening flood,
> Would I weak-shivering linger on the brink.
> Thus life redoubles, and is oft preserv'd
> By the bold swimmer, in the swift illapse
> Of accident disastrous. Hence the limbs

> Knit into force; and the same *British arm,*
> *Rising* victorious o'er the conquer'd earth,
> Must learn, while tender, to subdue the wave.
> Even from the body's purity, the mind
> Receives a secret sympathetic aid."

XV. A conscientious observance of cleanliness once introduced, or rather established by commandment, and kept alive by commendable and serviceable employment, the men will then be inclineable to its performance, and even be more agreeable and comfortable in their own feelings; instead of presenting a squalid spectacle, offensive and disgusting, and miserable in their own estimation. While they are in harbour, fresh water and soap are the most proper; but when fresh water cannot be allowed for these purposes, the marine water must be employed. Fine oat-meal will now be found a convenient substitute for soap; but if this latter is formed with a superabundance of oily or fatty matter, and thus be capable of blending with the salts which the sea water contains, its operation will be much improved. Or the lomentum of the ancients, the bean-meal, as mentioned by Martial, Cicero, &c. will be found another excellent and commodious substitute. This article will combine with any greasy matter on the surface; and, after the cleansing is accomplished, the skin will be left smooth and pliable. These cheap substitutes for soap should be tried; they will be found to entangle all tenacious matter which may be inclined to adhere to the surface; it therefore seems adviseable to keep those in view when soap is not supplied in sufficient quantities, or when it may have all been expended. " The want of soap, abroad particularly, is very generally the cause of great filthiness in the persons and the apparel of seamen. It would greatly tend to remove these evils, and consequently contribute to the preservation of their health, if this article were to be supplied by government, and issued by the purser to the people in such quantity per month, as may be deemed necessary."

XVI. The operation of washing the people, as formerly explained, is always admissible in the warmer weather of most climates, and in the tropical almost invariably, and as frequently as requisite. The preservation of cleanness should, therefore, as an essential article in the regimen adopted for ensuring health, never be wilfully neglected. The performance of it requires no expense, which would almost be an exclusive argument against its use, unless those miserable fellows should be spontaneously actuated by such principles as would promote a disposition to cleanliness. This fortunate inclination, however, is, unhappily, amongst seamen, rather an infrequent qualification. Some who have been trained under the influence of a discerning discipline, afterwards maintain so much of a beneficial acquirement, as voluntarily to keep themselves in a state of acceptable cleanness. This conclusion, however, is only applicable to some steady intelligent individuals, and founded upon too insecure a footing to constitute a law of continual application. In the coldest weather of northern and southern latitudes, it cannot be so frequently administered, but there it is not of such great importance, although its opportune employment is indispensable. Amongst the vigorously healthful, this commendable performance must not be overslipped. The occasional application of cleansings, in these situations, may be sufficient, but must be repeated as naturally occurring necessity may require. After all these suggestions, it is admitted, that discretion and suitable information must regulate the whole business. In the very rigorous weather of northern winters, it may sometimes be proper or necessary, that the men should be washed in water heated to 60° or 70°, which will render it both more agreeable in its application, and more efficacious in loosening and removing nastiness.

XVII. Those people who are habituated to the more temperate, and also, occasionally, the more inclement latitudes, are virtually capacitated for submitting to the psuchrolusia, or cool lavation, in every subsisting proportion of atmospheric temperature. The Russians are particular and celebrated examples of the capability of enduring the important and sudden alterations or alternations in the process of bathing. The employment of the cold and warm bath alternately, is with them a common practice, and the transition from the one to the other is quickly performed. These irregular and disproportionate exposures do not constitute any difficulty or cause of dismay to a Russian, for he can straightway proceed from the warm bath and plunge into cold water, roll himself in snow, or endure the frigorific embrace of the atmosphere at the freezing point, or even the commencement of Fahrenheit's thermometer. Such extensive alternations would, to the unaccustomed, appear dreadful extremes, and naturally produce the apprehension of immediate inconvenience or speedy destruction. A misfortune, however, concomitant with all these customary practices amongst the Russians, is the prevalence of abominable dirtiness, which is so offensive to foreigners as to be made the subject of satirical accusation. This illustration, deriveable from Russian practice, confirms what a constitution of moderate soundness, and, especially, if previously accustomed to these impressions, may bear with apparent impunity. Many of the inhabitants of Britain undergo very important alternations of temperature in all its mutabilities, without even considering the importance of these vicissitudes, unless they should consequently and accidently be seized with some uneasiness or complaint, from these circumstances and their own imprudence. The transition is frequently made from an apartment whose temperature may be 70°, into the atmosphere at 32°, or even some point of still more considerable diminution; and all this is often done without any proportionate precautionary management. The interchange is sometimes retroverted, and the translation is from a lower to a higher temperature, and yet no perceptible inconvenience is experienced. These remarkable contrarieties of temperature are, however, frequently, the productive causes of manifold hibernal complaints. The person possessing firmness of constitution, and who is, for a time, unassailable by occurrences of ordinary force, laughs at all these circumstances. But here it may be observed, as can be understood from what has been formerly explained, that water of the same demonstrable temperature with that of the atmosphere, and especially when this has a reference to its coldness, will have a greater effect in cooling the body, than the common air in the same circumstances.—The superficial cleanness in every situation is always commendable and advantageous, and is particularly conspicuous in the navy, and would, in all ships engaged in trading concerns, be one of the most serviceable prophylactics, and also one of the most effectually extensive strengtheners of the constitution. The virtuous man who keeps his skin clean, and modifies and proportions his clothing agreeably to the severity or clemency of the seasons, generally opposes, with increased facility and capacity, the most of contingently unfavourable circumstances.

XVIII. In the colder weather of northern or coldish climates, it is a common mischief among sailors, that they seldom, if ever, pay sufficient attention to the maintenance of cleanliness. This disregard relates both to the condition of their bodies, and that of their clothing. It is very seldom that the sailor in the coldest weather, winter for instance, considers it adviseable to remove the accumulated nastiness from the surface, and his garments also are commonly charged with a multifarious aggregation of uncleanness. If a sailor washes his hands and face it is generally the utmost of his performances in the way of purification. This abominable and reprehensible indifference, even about matters so eminently necessary to their own welfare, or even ordinary comfort, is not only conspicuous in sailors, but there is not uncommonly much remissness in those who should act the part of superintendents. After this manner many unclean persons, who have no virtuous disposition, or inclination to cleanliness, wallow in nastiness both of their bodies and clothes, and even of their bedclothes, for the whole of the cold months of winter. If they will not spontaneously attend to a sufficiency of corporeal cleanness, it should be maintained by rigorous command. As the coldest water may be disagreeable to some, it may be allowable, as lately hinted, while the winter months continue, to make all the common sailors purify themselves by means of water of a higher temperature. The whole body should thus be properly cleansed, and the operation repeated as frequently as necessary. If the water to be employed be heated to 60° or 65°, it will make a comfortable and beneficial impression upon the surface, and be relatively of sufficiently high temperature. If, in particular instances, a greater degree of warmth is suitable, as, for example, 70°, 75°, or perhaps even 90°, which in oldish men, or those who may labour under some states of visceral disorders, or who have lately returned from a warmer climate, may be commendable. The temperature should be proportioned accordingly. The coldness of the water, therefore, or even of the season, should never be allowed as an exclusive argument against the preservation of cleanliness.

XIX. In harbours or maritime towns, whether the ships of the Royal Navy or other vessels commonly resort, it would be useful to have baths or places for cleansing, constructed so as to accommodate the seafaring gratuitously; at least common sailors should be served without any expense. In large ships, suitable contrivances for bathing might be easily fabricated; and thus the water could be provided of any requisite degree of temperature, from that of the human body, downwards to that of the atmosphere, which will thus, in the winter season, often be as low as 32°, &c. of Fahrenheit's thermometer. This is not an unreasonable or unprofitable commendation, but a proposal comprehending, in its practical adaptation, the most serviceable consequences. The institution of places and machines for bathing, would not be exclusively applicable to the maintenance of cleanness—the employment of baths, of modifiable proportions of temperature, might be justly deemed as forming part of the conservative apparatus; and what is further on this subject, the warmer bathing might be used with the greatest benefit in different diseases, not only of the surface, but also in those originating from, or supported by, the peculiarities of constitutional qualifications. The modification of the temperature of the water, employed for the purposes of bathing in the colder seasons or climates, will thus be particularly advantageous; and the more attention there shall be bestowed upon this subject, these consequential advantages will be additionally receiving confirmation. In the warmer climates, the water as obtained at its natural heat will commonly suffice, and, if seasonably employed, will seldom be attended with, or followed by, any disadvantage. In the summer season of the temperate latitudes, water artificially heated will not be often necessary. The contrivances for purifications may also have connected with them shower-baths, possessing different degrees of impetus and density of the aqueous streamlets; and the general amount of the momentum will, in some measure, be determined by the altitude of the whole machine. In all ships of considerable magnitude, a bath of this description should always be constructed, and may be beneficial in various ways to a ship's company. In all situations where the head may have suffered from improper exposure to insolation, the imber densus, or thick shower, briskly directed upon the head, will be wonderfully efficacious.

XX. In voyages to the Eastern or Western Indies, &c. while proceeding betwixt the tropics, if ships' companies are each parted into three watches, every division, as formerly remarked, will have an opportunity of performing the necessary and beneficial operation of cleansing themselves every third morning; and this proportion of repetition will generally be found sufficient in fulfilling any requisite purpose for the preservation of cleanness. If considered adviseable to be more frequently repeated, this can be very conveniently accomplished at any time which may be deemed most appropriate. Cleanliness, to be effectually advantageous, must be an almost continual practice. Such things have happened as paroxysms of cleanliness, but this virtue has generally soon lost its beneficial consequences by discontinuance. The practical evolutions having a tendency to the conservation of cleanliness, will, as otherways serviceable, be materially obstructed or even frustrated, if the requisite attention to the cleanness of their ordinary wearing apparel be neglected or overlooked. An observance of a diversity of subjects, therefore, in the management of this department, is unavoidably or necessarily implicated; "sed dimidium facti qui cœpit habet," mundare "audete." Necessity, which is powerfully determinative of a multitude of occurrences, imposes upon seamen the task of cleansing their own clothes; and this should be more frequently done than is commonly observeable. The deficiency of their assortment of garments too, frequently determines them to use several articles without the possibility of the necessary repetition of washings and scourings. The fewness of their habiliments, moreover, subjects to another insurmountable disadvantage; if they should, from a disposition to cleanness, frequently wash those clothes which they may have, they are thus, from the frequency of the cleansing processes, more liable to destruction and devastation. And from inattention to cleanliness, in this incommodious insufficiency, another mischief originates—these coverings become contaminated with filthiness, and thus are peculiarly injurious and detrimental to the unhappy sailor who is liable to the disadvantage of these circumstances.

XXI. Their method of washing, and especially that of those not accustomed to a sea-life, is seldom fit for the removal of all collected filth, and whose abstersion is frequently rendered more difficult from its continuance,—and thus their clothes become particularly and extensively impregnated. This blameable inattention to corporeal cleanness, and also to that of clothing, is the fruitful cause of a disposition and proneness to multiform complaints and unpleasant affections, which so commonly predominate in ships' employed for mercantile purposes, or occasionally in those of transportation. This disagreeable foulness is sometimes attributable to the men's slothfulness and inconsideration; and when arising from insufficient knowledge, and no anticipation of the consequences, is, in a certain measure, pardonable: but when commanders or others, by whom these circumstances are controllable and removeable, are disregardful of considerations of such importance, they should be adjudged as wilfully disqualified for superintending any distributive management among their fellow-creatures. Instinctive inclination as naturally subsisting, even exclusive of artificial instructions, should contribute arguments sufficient for inculcating the propriety, and demonstrating the usefulness of cleanness in their habiliments as well as in their corporeal purification. It presupposes, therefore, unpardonable neglectfulness and unconscionable perverseness in those who are in possession (which is always possible,) of the conveniency or opportunity, but who are without the commendable inclination of maintaining cleanliness. This is particularly necessary to the comfort and health of those who are unhappily appointed to live in marine confinement. The maintenance, therefore, of that attentive management which ensures the preservation of cleanness, if otherways not attainable, must receive confirmation by the continually operative compulsion of constituted authority. In all ships appointed with men under suitable regulations, when once the advantages of cleanliness are understood, there will seldom be required any constraining measures for its commendable employment.

XXII. The coverings which are applied to the surface, and especially in the inflamed latitudes, or where the people are exposed to much labour, or any occupation whereby they are liable to have their garments soon defiled, should be often shifted, which will be conducive both to comfortable and healthful dispositions. Some from inattention, and others from laziness, commonly neglect even this useful attention to themselves ; and, therefore, in these circumstances, they should be obliged to change the covering next the general surface; and, if necessary, which will commonly happen, their bodies should previously undergo suitable ablutions,—and these processes should be repeated as frequently as necessary. When they are possessed of the suitable changes of apparel, formerly commended, they will thus be enabled to maintain themselves in a state of sufficient cleanness by changing and cleaning their clothing according to variable necessity. Those articles of woollen clothing, which are so frequently but very improperly employed, even in the warmest climates, are likeways permitted to continue contiguous to the surface, even after they are offensively and injuriously contaminated with nastiness. They too, from their contexture and colouring, are well calculated for concealing the filthiness with which they are impregnated; and, therefore, commonly preferable to those, who, through slovenliness, give encouragement to uninterrupted uncleanness.

XXIII. An inadequate or ineffectual observance is occasionally remarkable, and deserves to be mentioned, and that with the intention of recommending the suitableness of more effectual and appropriate management. The misconduct is, that in many ships no sufficient attention is bestowed upon what may be denominated, more properly and rigorously, personal or corporeal cleanness, but only an indeterminate and insufficient glancing of their habiliments. The people are generally assembled once weekly, (on Sunday, for instance,) and they awkwardly and hobblingly go in procession before their pretended inspectors; and, if it is temperate or good weather, the best of their clothes are commonly brought into temporary requisition; and thus, if no remarkable circumstance falls into view, the processionary deployment soon comes to a conclusion. Those garments which they had assumed while they acted their part of the dramatical performance, are again, most commonly, in the course of the afternoon, deposited, and must be forthcoming at the subsequent hebdomadal revolution. After the deposition of the holyday-garments, the squalid clothes in which they had previously wallowed for weeks, or even months, are re-assumed; and thus this farcical exhibition, when the weather is moderate, is a customary proceeding during a long voyage. It may be put as an interrogation, whether this management be sufficient to the maintenance or preservation of the requisite cleanness of a ship's company? This imperfect description does not comprise every antecedent or consequent circumstance. For it may be said, that although they have the appearance of extrinsical cleanness, nevertheless, the cutaneous surface continues with an involution of filthiness, and which, excepting from accidental removal, remains in undisturbed occupancy.

XXIV. "Great pains should be constantly taken, that the men are cleanly in their persons, and that they are furnished with all necessary cloathing. And the method so generally adopted of appropriating the ship's company to the care and superintendance of the several officers, renders the accomplishment of these necessary and important requisites extremely easy.—Seamen have a custom of dressing themselves to undergo inspection at stated periods, while at other times they are covered with rags and nastiness. They should be compelled to keep their trowsers and other cloaths clean, how much soever they may be worn; and that they may have no excuse for raggedness, there should be a tailor to every division, whose sole employment, under the direction of the officer, should be in keeping in order the cloaths of the men belonging to it. Whenever any payment is made on board, the officers of divisions should take care, that their men do lay in a sufficient stock of cloaths, with soap, and such other articles as may be necessary for them, before they are allowed to squander any of their money in dissipation. And where these payments are made upon the eve of the ship's going to sea, the men should be induced to lay in a stock of onions, potatoes, and even tea and sugar. It is inconceivable to those who have not seen the good effects of it, how much such attentions preserve the health of a ship's company.—The bedding of seamen is, in general, too little attended to; for as they sleep without sheeting, their blankets must unavoidably become offensive and injurious to their health. Their beddings should therefore be frequently well aired, by being hung upon lines fixed for the purpose; and their blankets should be washed as occasion may require."

XXV. A moderate share of attention to the foresaid subjects will not be sufficient if not conjoined with the necessary cleanness of the different articles of bedding, as remarked in the foregoing quotation. A disgraceful, an inexcuseable share of carelessness, in merchantmen particularly, almost universally predominates, in regard to the cleanliness so commendable and advantageous in this department. The hammocks themselves are sometimes scrubbed; but what cleansing processes do the other materials undergo? A few individuals virtuously disposed to cleanliness, may, while in harbour, have occasionally submitted their bedclothes to some kind of purification, but very ordinarily they are not once even in the length of an Indian voyage freed from their abominable filthiness. The hammocks with their furniture, (if any blankets, &c. remain, which may be a question after they arrive in an Indian harbour, and, therefore, especially in a homeward voyage,) are not, as would naturally be expected when the condition of the weather allows their exposition, subjected to the influence of the atmosphere; but the whole, as soon as disburdened of the morning slumberer, are collected, and rolled up in a compact bundle, and begirded with a ligature. The handsome and wholesome package, at the intonations of the morning's whistle, is transferred to the place of its customary deposition; and there continues till the vespertine strepitus of the same instrument announces its revocation. But this is not all, the description of the mischief is not yet complete; for after their lodgment in their particular receptacles, commonly styled the nettings, they are generally, with perverse iniquity, and even in the finest weather, carefully secluded from the admission of pure air by the imposition of tarpawlings. In this manner they are compactly kept, until they are again considered expedient for the use of the miserable employers, and thus they continue wallowing in previously collected and carefully retained nastiness. This is an appropriate and not ridiculously exaggerated representation; and if still deemed adviseable for the continuance of the healthiness and happiness of seamen engaged in merchantmen, must have its proportionate encouragement; but is here most particularly and peremptorily discommended, and management of an opposite kind most earnestly suggested.

XXVI. A rational thought on the subject, even amongst the uninstructed, would immediately intimate the propriety and advantage of exposing these articles, whenever the clearness, dryness, or other suitable properties of the weather, are convenient to this purpose. And here it is agreeable to the intention to remark, that this occasional or rather frequent exposition is eminently desireable and requisite in the tropical climates, in which there commonly is such an augmented cutaneous exudation evaporating, and which afterwards necessarily becomes more or less incorporated with the substances which are contiguous; and, as sailors, as already observed, commonly use blankets instead of sheeting, these teguments become highly charged with animal matters, and thus detestably contaminated. By a suitable exposure of their hammocks with all their appertinents, a considerable proportion of this defilement will be dissipated by exhalation; and thus their hammocks, with their contents, will be kept in an agreeable state of dryness, which is undoubtedly a consideration of some importance. Among a numerous ship's company, this exposure cannot, probably, be accomplished with all the hammocks diurnally, but may be practicable by judiciously apportioned subdivision, conformably to attainable convenience; and thus the intention will be fulfilled as frequently as requisite. In the tropical or other warm climates, or the drier and warmer seasons of most climates, the hammocks, bedding,

&c. may thus be readily and suitably kept in the necessary degree of dryness; but, in rainy or damp weather, the matter will be attended with more difficulty. In the northern latitudes, where so much dampness prevails, some attention is required to maintain their hammocks, &c. sufficiently free of all moisture; and hence the propriety of the subsequent proposal of having the mattresses painted, or otherways made impregnable to all dampness.

XXVII. Above it was observed, that the hammocks are sometimes scrubbed, but no attention given to cleansing the bedclothes. This, however, is a grievously offensive piece of negligence, and frequently productive of mischievous consequences. These unhappy creatures are continuing their nocturnal repose, enveloped in coverings which have, perhaps, not been cleared of their foulness for the preceding twelve months. The prevention of these inconveniencies is expeditely accomplished, at same time demanding distinctive management; disregard of it being followed by more extensive and destructive consequences than are at first sight conceivable. Careful reflection upon this subject, and confirmation drawn from immediate observation, would, if possible, additionally corroborate the indisputable usefulness of a more appropriate management in the preservation of the cleanness of sailors' bedclothes. The inconveniencies consequential to neglectfulness of this affair must have been demonstrated to all, but neither sufficiently comprehended nor acknowledged; and, therefore, as too customary, instead of referring this, a consideration of such importance, to the natural pleasure and disposition of individuals, it should be under the guidance and discipline of those properly qualified to oversee and regulate the business.

XXVIII. In the currency of a voyage to India, the bedclothes should be thoroughly freed of all their foulness at least once every month, or even more frequently, and especially in the tropical latitudes. If cotton sheeting is employed, as formerly and earnestly commended for general coverings, the operation of cleansing will be easily performed,—this substance will, in these climates, undoubtedly constitute the most agreeable and convenient. The mattresses, the coverlets, &c. should be properly exposed; and it may be adviseable, that the mattresses should be occasionally beaten, or the stuffing materials taken out and well aired, by exposure in dry weather and then replaced. During this process, the external coverings of the mattresses may undergo the operation of washing, drying, &c. These are operations, however, needful to the supporting of cleanness, which are seldom or never taken into consideration; but the keeping of these articles of bedding sufficiently clean is of great importance, for, frequently from inattention to the cleanness of these materials, much mischief is done to the occupiers. Their bedding becomes the habitation of abominable nastiness; and may frequently be the depositories and the fruitful source of contagious complaints. But even without the possibility of their bedding materials becoming the impoisoned receptacles of the substance of hazardous distempers, they are frequently offensive from their nastiness and odour, which are sometimes particularly disagreeable. By this accumulated nastiness, and the constantly unpleasant effluvia which they are communicating to the surrounding atmosphere, they thus contaminate, in an especial manner, the air contained in the deck wherever they are exposed for the purpose of sleeping. Agreeably to the common method, which has already been shortly explained, the compacted state in which their hammocks with bedclothes, &c. are maintained during the time they are unoccupied, is one of the best plans of preventing the disengagement of the noisome effluvia which have been communicated to them in the night-time. The hammocks themselves, in this manner, become at last defiled and charged with animal matters ; and thus the whole apparatus not only become peculiarly displeasing to all who have to come within their influence, but must be singularly uncomfortable to those who are obliged to occupy them by way of nocturnal lodgement. These would seem to constitute powerful arguments in favour of the proposal of the frequent and suitable exposure of all these substances to a free and dry atmosphere.

XXIX. The coverings of the mattresses, if they have, as lately hinted, been previously painted or otherways prepared, and rendered capable of excluding the absorption or entrance of moisture, or of any animal exudation, will not require part of the forementioned expurgatory management. Another remark may be made before leaving the subject, and which appears to comprize this proposal, that when mattresses are replenished with the ordinary materials, and when the external coverings are not defended against the admission or harbouring of nastiness, dampness, &c. they should be exchanged for other stuffing materials in possession of sufficient cleanness, firmness, and springiness; and this should be performed with the adequate frequency, otherways they may, in some circumstances, become mischievous or pestilential. In crowded ships, and where the requisite attention to cleanliness is not properly conferred, and especially in boisterous weather, when the lower ports cannot be safely opened, the air of these confined spaces between the decks sometimes becomes very offensive and corrupted. It is not only deteriorated by respiration, but also additionally inquinated by the effluvia emanating from the people's surfaces, and those proceeding from their hammocks; the consequence of perspiration which may have been accumulated in the night, and afterwards gradually disseminating themselves into the encompassing atmosphere. It may here be, moreover, remarked, that in proportion to the closeness and thronging of these apartments, and, frequently, inattention to ventilation, the temperature of the air contained is often considerably augmented, so that there may be a difference of 10 or more degrees of the thermometer. In these circumstances, when dirtiness, moistness, and augmentation of atmospheric temperature act conjunctively, the inconveniencies are commonly much aggravated. These considerations, therefore, in combination with what has already been advanced in the disquisitions on the atmosphere, and what hereafter may be said on ventilation, will abundantly demonstrate the propriety and benefits naturally to be expected from the unintermitted preservation of cleanness.

XXX. A judicious and attentive observance of these instructions, with the requisite performance of the duties which they naturally comprehend and recommend, will wonderfully co-operate in supporting the comfort and health of seamen. The officers of ships are frequently enabled to escape manifold unpleasant uneasinesses and distempers, so ordinarily assailing the common men; and which capability is principally explicable and computeable from their comparative cleanliness, and other more comfortable circumstances. These observations, absolutely considered, are, perhaps, more particularly and immediately applicable to trading vessels, in which the necessary discrimination, and kindness, and proportionate management, are not so conspicuous. In the same general exposure and services, this difference of consequences to the common sailors and officers is frequently remarkable; and which seem to be exclusively determinable by the discrepancy of the nature of their dietetical ministration, of their lodging, and, as just said, of that of their respective cleanness. The acute observer may even perceive a graduation of difference, from the officer who is most comfortably circumstanced, down to the most slovenly common seaman. The careless and dirty midshipman and younger officers, whose sustenance is frequently of an intermediate description, and whose clothing, cleanness, lodging, &c. partake more or less of similar properties, will exemplify and represent some of the interposed links of progression and concatenation. And, therefore, it appears, that corporeal cleanness supposes and implies that attention which is so peculiarly necessary in preserving a continual exclusion of foulness, and which is efficiently productive of the most desireable and beneficial influences upon that part of mankind which is obligated to submit to the unnatural and afflictive confinement, and other multiplied hardships so inseparably accompanying a life spent on shipboard. The whole mysterious procedure, then, and supposed difficulty, are included in *preserving the body, and wearing apparel, and bedding, &c.* invariably in a state of *sufficient cleanness.* And this part of the subject having passed through a compendious examination, the other general division, the accommodation of the people, &c. cleanness, &c. of the ordinary places of their residence, are not undeserving of some consideration.

XXXI. And here it may be remarked, as a consideration of extensive application and importance, that although particular attention may be directed to maintaining the cleanness of individuals, nevertheless, it becomes eminently adviseable, and even absolutely necessary, to contemplate all their surrounding appertinents. And, as their habitations are understood to be on shipboard, these, therefore, with some of their circumstances and peculiarities, are here to be shortly considered. Cleanness, as personally applicable, and of raiment, &c. is undoubtedly commendable, or, what is still a more irresistible consideration, it is continually remarkably serviceable; but even the otherways beneficial tendency of this will be much diminished or disappointed, if the requisite cleanness is not thoroughly maintained in their ordinary places of abode or habitations. In His Majesty's Navy, considerably more attention is conferred on the preservation of cleanliness, than in those vessels employed for the purposes of commerce. In these latter also, an important difference prevails in the proportions of cleanness, conformably to the trade in which they may severally be engaged, and the dispositions of those to whom the guidance and act of overseeing are committed. This difference is manifested in the comparison of a common coalier and an Indiaman, which is under reasonable discipline; in the former, nastiness is, commonly, in possession of its disgusting ascendancy; and if it were not for the coldness of climate, the ordinarily unrestrained influence of the atmosphere, and the qualifying nature of their victuals, the inhabitants of these vessels might be overwhelmed in the noxiousness of their own filthiness. In the Navy, regulations instituted upon propriety, suggesting, and advantages demonstrating, the perpetually applicable state of cleanliness, have thus established its usefulness and indefeasible employment.

XXXII. As accommodation, or the suitableness of circumstances, is, to the seafaring, a consideration of indispensable importance for the comfort, cleanness, and conservation of the healthiness of these people, a few desultory observations upon this subject, in connexion with the other circumstances, may not be unacceptable to those comparatively unacquainted with the affairs of sailors, and may, probably, be not altogether inadmissible by those who act as superintendants, and who are thereupon more or less accountable. The extensiveness of ships' complements is generally determinable by their capaciousness, and the circumstances of their employment respectively. The proportions of ships' companies may vary from two or three individuals up to a thousand, or even a number more considerable. In all ships intended for warlike purposes, the proportions of their companies are always larger than those of the vessels employed in commercial undertakings; the intentions of aggression and defence require this greater number in their respective complements, and this proposition applies to these warlike vessels, proportionably to their largeness. In consequence of this, these vessels are commonly more crowded than those vessels occupied in trafficking proceedings. This circumstance is principally of importance in reference to their lodging and sleeping, and the obtaining the necessary supplies of pure air, and the maintenance of cleanliness. The largest merchant vessel seldom carries more seamen than one hundred and forty, or one hundred and fifty; but a ship destined to the purposes of fighting, &c. and perhaps of not more extensive dimensions, is obliged to contain a fourfold proportion; and, consequently, four men occupy the space allotted to one on board the merchantman. This disproportion of numbers constitutes a prodigious difference betwixt even ships of actually the same magnitude; and, if it were not for the improvements effectuated in the discipline, cleanliness, arrangements, accommodation, and other circumstances of warlike ships, this comparative accumulation would, as in former periods, be accompanied with more considerable disadvantages. This crowding on shipboard is of singular moment, especially on account of the inquination of the atmosphere with which they are, in such circumstances, encompassed, and, if possible, still more in the nightly season, or during repose, when the ports are commonly closed, or at any time in stormy weather when these openings are needfully obstructed. The consequent closeness is additionally important in the warmer climates, where the temperature often becomes so disagreeable, or even distressing; and this will be considerably aggravated by the inconvenient accumulation.

XXXIII. The following quotation from Dr. Trotter, may illustrate and represent some of the mischievous inconveniencies resulting from unreasonable accumulation, and, consequently, the ills of defectiveness in accommodation. When mentioning some of the hardships which the miserable Africans, who were inhumanly kidnapped and purchased, &c. for the Western Indian Islands, states: "It will be proper to observe here, that these poor wretches are shackled in pairs by the wrists and ancles; when they come upon deck, two long chains are passed through their irons at the ancle, which reach from the forecastle to the barricade, for the purpose of confining them to one spot. The rooms where they are secured below, are from five to six feet in height, according to the size of the ship; but besides the number that lie on the deck, about one-half as many are stretched on what they call a platform, that runs along the sides of the vessel, raised about two feet and a half from the floor, and of breadth sufficient for the length of a man." Trotter here subjoins in a footnote, ('If I am right informed, a section of this ship was laid before the Society for the Abolition of the Slave Trade, in order to calculate what space was allowed for each individual to sleep upon, when she carried 650 slaves.') "Here they are stowed *spoonways*, according to the technical phrase, and so closely locked into one another's arms, that it is difficult to move without treading upon them. The rooms are imperfectly aired by gratings above, and small skuttles in the side of the ship, which, of course, can be of little use at sea. The gratings are also half covered when it blows hard, to keep out the salt spray or rain. The temperature in these apartments, when they become crowded, was sometimes above 96° of Fahrenheit's scale. A misfortune befel my thermometer in the latter part of the voyage, so that I had not an opportunity of measuring the heat when the rooms were as full as they could hold. I myself could never breathe there, unless under the hatchway. In such situations, it may be supposed, that the sufferings of these creatures are sometimes dreadful. Air, heated and rarified to such a degree, and loaded with animal effluvia, cannot fail of being noxious to life; there were certainly instances where some expired from suffocation, having shown no previous signs of indisposition."—This may suffice as a specimen of the dreadful sufferings of fellow-creatures, and a satisfactory exemplification of the disadvantages of ill accommodation and accumulation.

XXXIV. Such, then, is the terrible picture drawn of the sufferings of these miserable creatures, when they are unreasonably and unmercifully accumulated. Next in order to what these slave-ships were, the common transports are objects of consideration. In these vessels, which are commonly of small size, much crowding is frequently allowed, and sometimes unavoidable. This unnatural closeness applies, likeways, especially to military, who are men that generally may be supposed to be altogether unaccustomed to a sea life, and, therefore, the circumstances to which they are subjected are considered the more disagreeable. Other evils also arise from the inconvenience of changing their clothes, or even of cleansing themselves. In stormy weather, or even when it is moderate, those people who are not accustomed to the motions of a ship —and in these small vessels they are often quick and frequent—they often become sick, and vomitings and purgings are sometimes the consequences. The whole thus becomes a scene of nastiness; and from the feelings of disgust and loathing, those who might otherways escape the accession of sickness, are implicated by sympathetic communication, and this generality of the evil tends to the aggravation and dissemination of the uncleanness. Even when recruits or military are sent on board a common Indiaman, they are often sickened, and thus become the source of defilement. The same conclusion is applicable to sailors occasionally, and especially to those not much practised in marine exposure and commotion; and thus landsmen, as they are denominated, upon embarcation, or before they are acquainted, with the strangeness of their circumstances, are likeways a common cause of filthiness, and partly arising from the occurrences aforementioned, and also from uncleanness and awkwardness. After these are accustomed to their situations, their accommodation implies less difficulty; and, even in a similitude of circumstances, they frequently become less uncleanly; for here custom, as in many other situations of life, renders their management less incommodious, or diminishes the apparent difficulties.

XXXV. The accommodation of sailors is not an insignificant consideration, but rather of comprehensive importance. It is, however, in many vessels, too commonly disregarded; and it is thought, if seamen receive a moderate allowance of rough fare, that little more is necessary, and the suitable attention to their cleanness and lodging is neglected. And thus, unless they are prompted by virtuous dispositions, they are allowed to wallow in uncomfortable nastiness. The convenience and suitableness of their circumstances, it must be granted, are essentially necessary to the maintenance of their healthiness. The suitableness of circumstances comprehends their accommodation; and, from their manner of life, it moreover implies that state of existence, with all its concomitants, as commonly observeable on shipboard. This, as remarked in the Introduction, is not natural; it may be considered as a constrained mode of subsistence. The places of their habitation are materially different from those residences to which they have been naturally accustomed; they, also, themselves, are generally exposed to circumstances in their diet, dress, labours, and repose or watchings; implying more or less difference from those, with which they have been most experienced. After what has been previously suggested and explained upon the divisions of ships' companies, their allowance of repose, &c. enlargement upon these particulars seems unnecessary; and, therefore, the attention may be chiefly directed to some reflections on the preservation of cleanness, as applicable to shipboard. Experience sufficiently establishes the prodigious difference commonly subsisting betwixt those individuals, who either are careless about themselves, or who are insufficiently accommodated. This is frequently exemplified in the miserable condition of those profligates who have deprived themselves of most of their raiment, and who, perhaps, have not a hammock to repose in, when suitable or necessary. Some of these hopeless miscreants lie upon the deck, or steal the use of their neighbour's hammock, when it is in a state of disengagement. In merchant vessels, this is not an unfrequent occurrence, and is perhaps accidentally discovered, or it is displayed upon those occasions when hammocks come to be scrubbed; or probably, as has repeatedly happened to the marine practitioner, (the deficiency of bedding, bedclothes, &c. as is frequently remarkable in a returning voyage from India, &c.;) the want is manifested, in all its unfavourable circumstances, when the thoughtless sailor becomes the subject of disease; and this loss is most materially felt when they have passed into a considerable diminution of temperature. The imperfection of accommodation, and its unfortunate consequences, might be additionally illustrated and exemplified in various methods; but these accompanying or consequential inconveniencies must have been so frequently demonstrated to the experienced medical officer, that a lengthened examination of the subject would seem to be misapplied and superfluous. The advantages of suitable accommodation are also so conspicuous, and so thoroughly comprehended and appretiated, that, upon this department, tediousness of disquisition would be completely unnecessary.

XXXVI. But, as intimately connected with this subject, or rather constituting a part of the general intention, the lodging of sailors, or others in confined situations, during the nightly season, or the time of repose, is of some moment. From the nature of a ship, as being a mobile machine, and driven about, in some measure, at the mercy of the winds and waves, and often partaking of much commotion, it is rendered necessary that they should have their hammocks, or swinging beds, secured or fastened to the under surface of the upper deck of the apartment of the ship which they occupy. By this mode of attachment, the lateral vibration of their hammocks is considerably diminished, and also more clear space is left underneath. This is accommodation originating from principles of convenience, and probably, it may be said, of usefulness, and appears to be, in some measure, unavoidable; but it is not altogether free of disadvantages of another description. In crowded ships—which is always the case in men of war, transports, and sometimes in merchant vessels carrying recruits or military—or when they are overcharged, the men, being thus swung to nearly the same level, are all consequently respiring in the same stratum of air, which thus becomes additionally contaminated. The foul air, as it is vulgarly styled, (with the exception of the carbonate of oxygene, and which may exist in different degrees and modes of combination, which commonly, from its greater specific gravity, occupies the lower regions,) also predominates nearest the uppermost surface. This general tendency is aided by two circumstances,—the comparative lightness of some species of these airs, not calculated for supporting respiration; and also the increased rarefaction of the air in the upper region of the apartment. And this proportional augmentation of temperature, and consequently of rarefaction, is caused by the heat disengaged from the men thus accumulated, and which tends to the aggravation of all the accompanying inconveniencies. As the temperature increases, they not only become more uncomfortable, but the superficial transpiration is often increased; and this, likeways, renders the defilement of the atmosphere more considerable. When ventilation comes under examination, the most effectual mode of obviating or relieving those unpleasant occurrences, by the suitable admission of pure air—which indeed may be recommended as the sole and best prophylactic—will be further illustrated.

XXXVII. "Every ship inhabited may be justly said to have an atmosphere of its own surrounding it, in a greater or lesser degree; and it requires a more considerable force of wind to displace it than has been usually imagined: it probably adheres to the lee-side, and moves with it over the surface of the water. It is a common remark, that voracious fishes often follow ships at sea for many leagues together. In Guineamen this is said to be from a kind of instinct, that teaches them to watch for dead bodies; but a much better reason is, to attribute it to the smell, the effluvium, conveyed by the air in and about the vessel; for it is well known that the olfactory organs of fish are very sensible. Various matters impregnate the air with smell, such as provisions of different kinds; but the chief source must be the living human body."—In most ships, unless they are peculiar for their cleanness, there is a general odour, or mixed result of different effluvia, which is frequently of a particular description. This unpleasant smell is commonly very perceptible on approaching the leeward side of a ship, which is the one generally assigned for embarcation; and often the peculiar odour of a ship may thus be distinguished at a considerable distance. In this manner, a ship carrying lascars may often be known from one manned with white people; the former emanating the phosphoric odour sometimes very perceptibly and impressively. In situations where there is a great assemblage of boats, ships, &c. as in some rivers, harbours, &c. the general or combined odour is oftentimes very disagreeable. This does not simply apply to the outside of vessels, for the inside is often particularly disagreeable, and the lee-side of a deck is more unpleasant than to windward. This is exemplified in an Indiaman in the returning voyage, when a sail-room is constructed along the deck commonly occupied by the ship's company; the space betwixt this structure, and the ports admitting air, may be tolerably agreeable, while the space on the side of leeward is unpleasant; and this more especially, if the ports on that side, or the greater number of them, be in a state of closure; and thus, the people who occupy the lee-side are sometimes immersed in fouler air than those who inhabit the side opposite.

XXXVIII. "There is no situation where so large a number of human beings are confined in so small a space as in a man of war. In two and three decked ships this especially happens; and on various occasions we observe, that it materially affects health. In the production of scurvy this remark particularly applies. When a fleet of ships, under equal circumstances of health, goes to sea, composed of different rates, and cruizes for ten or twelve weeks in the Channel, the scurvy usually begins to appear; but it may be sooner or later, according to causes that are manifest. In ships of three decks, a larger number of cases will be found, in proportion to the complement, than in one of seventy-four guns; more will be observed in the two-decker than in the frigate; and in the sloop of war, or cutter, the proportion will be found the smallest of the whole. We suppose the diet of the whole to have been alike, and if the disease, as it first appears, is not distinguished by these gradations, we know that it has been warded off by means that can be accounted for; such as superior discipline, giving the people less fatigue in duty, &c. The generation and progress of contagion among ships, is nearly in the same proportion, and is better explained by the condition of the atmosphere than any other cause; such as the situation of the fire-place, which has been said to purify air, and destroy infection, by the smoke issuing between decks. At night the ports are lowered down and barred in; the chief places for the crew to draw air from, are the small scuttles, hatchways, and gratings, or wind-sails, which are seldom attended to at night. The air that is deprived of its oxygene by respiration of the people, if heavier than the common atmosphere, will descend to the lower sleeping place, and if lighter, will ascend. Whenever there is a greater number of decks, the air, in proportion, will become more impure as it comes less in contact with the external air and free ventilation. A large ship having less motion than a small one, also loses the advantages which a quick agitation gives to a body of air confined below, and prevents the mixture of the superior pure part with the inferior stratum which is contaminated. Thus the human body is predisposed to scurvy; an impure air accelerates the effect of the sea-diet. Thus, also, the contagion of typhus more certainly acts, as the body is left in a state of diminished excitement, by the stimulus of the vital air being withdrawn. Hence the necessity of a constant supply of pure atmosphere."

XXXIX. Some of the foregoing observations are generally applicable to the circumstances of accommodation of the seafaring, but more especially of common seamen, and have reference, more particularly, to the predominancy of their multifarious inconveniencies, and the propriety and usefulness of cleanliness. The attention necessary to the maintenance of cleanliness, will, in some measure, be determinable by the season of the year, the positive qualities of the weather, the amplitude and purposes of the respective vessels, and also their natural construction or adventitious arrangements; the number of people, the space subservient to their accommodation, with its comparative contractedness or extensiveness, and some other circumstances.—The common methods employed for cleansing ships, are washing, scouring, scrubbing, &c. with brushes, sand, and sandstones, &c. &c. These, it may be observed, are applied chiefly to the decks; and the upper deck, in some trading vessels, generally undergoes the operation of washing every morning. This, however, is not sufficient for the purpose, and is not, generally speaking, the place which will speedily damnify the health of a ship's company. The scouring or washing of the upper deck, is frequently done as employment to the morning's watch, more than from a conviction of its serviceableness. It is often done for ostentation, and to impose upon strangers, or those who are unacquainted with these circumstances: but, lo! they are, notwithstanding all this parade and farcical resemblance of cleanness, interiorly full of uncleanness and noisomeness. But this dissimulated appearance of cleanliness is not so customary in the Navy as in some of the merchantmen; and, from this accusation, the Indiamen cannot claim indemnification. With inspectors of ships, therefore, the more internal recesses should be the first places of examination; and their determinations should be drawn from the circumstances of their investigation. It is their business, as just said, upon their entry, for the purposes of examination, to dive instantly to some of the more internal recesses, in which places there were the smallest expectation of a scrutinizing exploration. Uncleanness, in a hypothetical state of concealment, (and therefore considered as innoxious,) will frequently be discoverable; and the inattention should receive a proportionate reprehension. The space betwixt decks is certainly more peculiarly interesting than the upper deck, which is so commonly subjected to the formality of scouring, &c. In that allotment of space, which the men, when unoccupied, principally hold as a habitation, and which is likeways the place appointed them for their nocturnal reclination, and where they receive and consume their victuals, there should cleanness be particularly remarkable. And here, moreover, animal and vegetable remainders, of different qualities, are frequently, but carelessly and improperly, deposited; and, if not removed, in the warmer climates especially, they speedily become putrescent, offensive, and ultimately injurious.

XL. As the subject of accommodation can never be sufficiently regarded, the following remarks from

Trotter, on the evils arising from transferring ships' companies to hulks, &c. may tend to show its importance: "When a ship goes into dock, or when in want of other repairs, the crew is lodged in an old hulk for the time, which is appropriated to that purpose. These vessels, in the winter season particularly, are the greatest drawbacks on the health of a ship's company that I am acquainted with. They are not weather proof; therefore cold, leaky, filthy, and badly ventilated. But these imperfections become serious grievances, when the people of a first or second rate, come to be confined in the hulk of a sixty gun ship, like the Rippon. At this time also, some hundreds of women and children flock to the ships in harbour; and the crowded appearance of the decks, with the surrounding wretchedness of the whole apartments, exhibit a combination of every thing that is calculated to generate disease. The opportunities and means which the men now employ to procure the poisonous spiritous liquors, which are vended in the naval sea-ports, give the finishing stroke to this ghastly scene.—It may appear singular, that abuses of this kind should be allowed to tarnish the naval discipline of the present day. The plain truth of the matter is, that the respective captains, when ships are in dock, either live altogether on shore, or are absent on leave for private business. They see nothing of what I am describing; and it does not appear, that any of the port officers ever gave themselves the trouble on the subject." And he adds, in a note, "Captain Lane of the Cambridge, first looked into these vessels in 1801." These have been improprieties productive of considerable inconvenience in the public service: it is even a difficult matter to keep the sailors regular in any situation, but still more so in the situations above-mentioned, or even in harbour.

XLI. In relation to the accommodation of soldiers on board East India ships, Dr Lind offers the following observations: "As most of the ships which perform this voyage, are either newly built, or have been for some months unemployed, without fires or people on board, they become unwholesome. It would therefore be adviseable, in East India ships, before they are fitted out, to keep constant fires of dried wood for six or eight hours every day during a fortnight or three weeks. To evince the propriety of this advice, if, by way of experiment, a fire be made on the ballast, and the hatches shut, the smoke which issues from the crevices, will be found to have an intolerable stench, proceeding entirely from the unwholesome dampness of the timbers. To prevent infection, every recruit or soldier, when first sent on board, should be stripped of his old clothes, or rags, before he is permitted to go between decks. —During so long a voyage, a sufficient stock of clothes, with changes of linen, and particularly a good bed, are absolutely necessary. When a number of such people are sent on board, such of them as, not having a bed to lie upon, are obliged to sleep in their dirty clothes on the decks, or on chests, will be seized with frequent chills, resembling the fit of an ague; and afterwards have an headache, great thirst, and heat on the skin, which may sometimes be attended with a cough, pain of the limbs, or other accidental symptoms. These are the first appearances of that infectious fever, which often, in a greater or less degree, annoys ships crowded with soldiers. Some, in the progress of the disorder, will become yellow, others have spots on their bodies; but the head being greatly affected, and the low fever, clearly evince the nature of their disease.—As nothing will more effectually prevent this infection, than a sufficient stock of good clothes, and bedding for each man on board; so, on the other hand, nothing will abate its progress so much as carrying out a supernumerary quantity of beds, linen, and clothes, for shifting the men.—On the first appearance of this fever, and of the head being affected, the application of a blister, almost certainly, removes it; but, from filth and dirt, the most efficacious remedies will be rendered ineffectual. We have further to recommend, in East India ships, the same supply of necessaries for the sick, as is granted in the royal navy. A man in a fever cannot live on biscuit and salt beef. Barley, rice, currants, sago, sugar, spices, and even wine, seem essentially requisite for the perfect re-establishment of his health." This may be considered sufficient evidence on the general nature and moment of accommodation.

XLII. A mischief which is frequently prevalent, and especially in the nightly season, and when, too frequently, every aperture for the admission of pure air, excepting, perhaps, the hatchways, are in a state of occlusion, is, that this vital fluid is rendered abundantly contaminated. The diversified exhalations emanating from the cutaneous surface, and from the bronchia, &c. are floating in the air surrounding, and thus the defilement is gradually aggravated. By this unreasonable confinement, and the natural dirty inclinations of common sailors, the surface of every substance takes on an incrustation of uncleanness, and ultimately the most disagreeable and prejudicial nastiness. Where filthiness thus gets due encouragement, which is too commonly remarkable in most vessels of burden, the accumulation offensively and injuriously remains undisturbed. The surface of the deck itself may indeed be washed once a fortnight, once in a week, or even twice, during an equal period. This management, if judiciously regulated, it is allowable, is commonly so far advantageous; but its application is too diminutive to be universally serviceable. Every kind of defilement, however inconsiderable, or upon what part soever observeable, should always be removed. Every surface visible to the eye of the spectator, every surface to which impurity may be adherent, should be occasionally subjected to the action and influence of purification. In the management of this business, an indifferent and insufficient application of the means will be altogether unjustifiable; there must be a discriminating administration, as determinable by the nature of circumstances. In boisterous, or inclement, or dampish weather, washings should not be so frequently performed, unless all subsequent dampness is carefully dissipated. Some commanders, from an affectation of the appearance of cleanliness, are in the habit of causing their ships to be washed indifferently, without the proper consideration of accompanying circumstances. This is a work sometimes unnecessary, frequently highly mischievous, and proceeding from a vague desire of reputation misapplied, defective judgment, and a love of singularity. In the prevalence of the forementioned unfavourable circumstances of weather,

&c. scraping, scrubbing, &c. with dry sand, swabbing, &c. may, if properly performed, be sufficient.

XLIII. The following observations, taken from one who has possessedly written on the diseases of seamen, may strengthen the general purport of these reflections: "Order and cleanliness are the officer's most powerful resources for the preservation of health; but there are a thousand lesser circumstances to be attended to, which materially contribute to so desireable an object. The nature of cleanliness too, is often misunderstood; and I know of nothing of that kind which is so much mistaken as the too frequent and indiscreet drenching of the decks, and more especially those where the people sleep, with water, and particularly in cold latitudes during the winter. By this means I have known dreadful sickness introduced,—and I have known it removed by a contrary practice. It would be deemed extravagant to advance an opinion, that the decks should *never* be washed; but I feel no reluctance in making a direct assertion, that it were far better that they should not be *washed at all*, than with that want of discretion and precaution, which so generally prevails. It is an error that has caused the deaths of thousands! Certain it is, that the decks cannot be kept too clean; but they should be made so by other means than washing, except the weather be such as will soon cause them to dry, or that you have the means of drying them by fires. This observation applies to every deck in a ship; but in a particular manner, to those, where the people chiefly reside, or from whence the humidity particularly affects them: nor should they ever be permitted to go below after a washing until the decks are perfectly dry ; for it is a fact universally admitted, that moisture is the chief predisposing cause to almost every malady with which a seaman is affected. It particularly induces scurvy and putrid fevers. Seamen are naturally indolent and filthy, and are merely infants as to discretion, in every thing that regards their health. They will assist in washing decks and sit the whole day afterwards, though wet thereby, half way up the legs without shifting themselves, to the great injury of their health. They should, therefore, be compelled to put off their shoes and stockings, and roll up their trowsers on those occasions, which will not only cause their feet to be dry and comfortable the rest of the day, but necessarily cause a degree of cleanliness which otherwise would be disregarded. The practice, which has lately been adopted, of having stoves with fires placed occasionally in those parts of the ship where the men reside, and in others subject to humidity, is of the utmost importance to the health of the people, and should never be omitted in damp weather."

XLIV. As it is of the greatest moment to keep the space betwixt decks as dry as possible, and when necessary, the ordinary contrivances for promoting the evaporation of moisture, should be employed. At the same time it must be remembered, that if pure air is not introduced, the portion of this fluid in exposure to the influence of combustion, (part of the air indeed serving for its support,) will hereby, for particular purposes, respiration, for instance, be extensively disqualified. If ventilation is not conducted along with the processes for drying the decks, and especially if all the ports, &c. are shut, the air of the apartment must become still more loaded with moisture; and if the fires are withdrawn before the air, as well as the decks, &c. are dried, there must be a deposition of dampness after the operation is said to be concluded. The end to be accomplished, more particularly, is the dryness of the surrounding substances, many of which would, by the conjunctive agency of water, pass into a state of decomposition, and then disseminate unwholesome evaporations. All these labours and practices will, however, be ineffectual, unless some other circumstances are comprehended. For the completion of these intentions, and to make those in confinement, on shipboard, as comfortable and commodious as practicable, and also for maintaining the dryness so necessary, the casements of the port-holes should be fitted with the commensurate accurateness. This conformation and adjustment of the port-lids, scuttles, &c. will exclude unpleasant inundations, which are, in many ships, or in those which are insufficiently defended against aqueous intrusions, the frequent causes of annoyance and molestation; and thus a tolerable degree of dryness, if the ship is otherwise staunch, will be obtainable, which is of singular importance to the comfort and health of a ship's company. The dryness, and the sufficient ventilation of those parts of the ship, occupied by the people, should be considered as two of the most requisite circumstances for the maintenance of some degree of comfort, and above all, the preservation of their healthiness.

XLV. These observations extend so far in reference to the nature of cleanness on shipboard in general, and to the places of lodgment for the men in particular. Another necessary precaution is, that every article be so placed, and the whole be so arranged, as not to afford the smallest harbourage to the accumulation of nastiness, and also the greatest facility to the different processes of cleansing. This is peculiarly necessary in those parts of ships more immediately intended for the men's accommodation. No vegetable or animal materials should be scattered or allowed to remain betwixt decks, as they soon become very offensive; and when accompanied with wetness or moisture in the warmer weather, or in tropical climates, may, as will be shortly more explained, be productive of mischievous consequences. Each division, which is victualled or messed together, should be under regulation and enjoinment to maintain the requisite cleanness in their respective departments. This commendable cleanliness being authorized and established by appointment, the accomplishing of it will have consentaneous acquiescence. And, subsequently, a reasonable and laudable competition for excellence in cleanness, and this physically strengthened by an imitative propensity, will ensure its regular performance without almost any extraneous impulse. It may here be remarked, that in those ships where no judicious management is properly instituted, laziness, dirtiness, with all their unhappy and offensive effects, are predominating and reprehensible inconveniences. An applicable conclusion may here be made, and one not undeserving of consideration, that the men will need occasional excitement to the suitable and regular performance even of small duties, and these implicating circumstances deeply interesting themselves; the seasonable interference and gubernation of the knowing officer will frequently be serviceable. The slothful must not be overlooked or neglected, as thus they may become a prey to their own imprudence and sluggishness. The most careless and inactive may be improved, and gradually made more virtuously inclined. These hapless fellows, even in the most trifling affairs, if they concern the general welfare, must be instigated to dutiful observance, and punctuality, and sufficiency of performance. The diligent, the discerning, the humane, will consider nothing below their dignity which may contribute to the preservation of healthiness; and cleanliness, undoubtedly, constitutes an important appendage to the aggregate of circumstances contributive to its successful conservation.

XLVI. Cleanliness, as applicable to shipboard and every circumstance thereunto appertaining, necessarily comprehends every subject encompassed or circumscribed by its most distant boundaries. But the formality of attention to a few particulars, has hitherto precluded the sufficient generality of cleanness. The fulfilment of the desireable purpose will depend upon the extent and degree of cleanness maintained. The practice must be constant, universal, and adequate. No corner or crevice should be allowed to be the lodging of nastiness; this, in all situations, is offensive and hurtful, but in the warmer climates or seasons even of this country, is more pointedly and peculiarly injurious. The overloop, or orlop deck, and the hold or main body of the ship, will severally require their share of attention. When military are embarked for any destination, but especially when for the East or West Indies, &c. and which includes the expectation of an irksome and lengthened voyage, attentive observation and management are then of particular importance. In the larger merchant vessels, such as the Indiamen, the overloop is ordinarily appropriated to their accommodation; and this to them (continuing the passage to the oriental world, as implying such an extensive distance and consequent continuance of confinement,) may be considered as a disagreeable imprisonment. In this subdivision of ships, there are no openings for the admission of air but the hatchways; and these latter, therefore, must answer both for its influence and effluence. Those who are occupants of this apartment, are unavoidably subjected to more considerable inconvenience than those of the ship's company, whose allotment is the gun-deck; and their disadvantages arise principally from their confinement, augmentation of temperature, and the air's contamination. Continuing the passage in tropical latitudes, their circumstances often become particularly disagreeable. The annoyance from aggravated temperature, and the unavoidable confinement and defilement of the atmosphere, which is subservient to respiration, are very troublesome. In the continuance of these circumstances, the preservation of cleanness and the unintermitted introduction of fair pure air, and, consequently, the dislodgment of the foul and evil, should always be deemed absolutely indispensable.

XLVII. In Indiamen, it does not appear customary to expose the orlop to the operation of regular washing, only to that of scouring, scrubbing, &c.; but here it must be remarked, that what method soever be adopted for its cleansing, it should be thoroughly performed and repeated as occasion may require. The surface of the deck is generally the only place which undergoes any thing like an operation of cleansing,—but this is altogether inadequate to the intended purpose. The sides of the ship, the under surface of the deck over head, and of all the beams, &c. are commonly allowed to become uncleanly, sometimes even coated with nastiness. In these ships of burden, likeways, there is often part of the cargo stowed upon this deck, or ligneous inclosures for holding sails, or other articles of furniture constructed, which too frequently become the retainers of filth, foul air, &c.; or, if substances which are liable to decomposition, such as many kinds of victuals, &c. happen to be kept on this deck, they may evolve and disperse effluvia injurious to the inhabitants of this apartment. The same generally applicable instructions are agreeable to the military when embarked, as those proposed for the assistance of the seafaring. Unskilful and irregular recruits, who are sent on board for foreign destinations, are commonly very awkward; and especially in some of the forementioned circumstances, with which they have been previously unacquainted. The attentive, discriminating, and thoughtful officer, will occasionally interfere in supplying wholesome instructions for their acceptance and guidance.

XLVIII. An impropriety is too often allowed to subsist, and even in Indiamen, of the most extensive dimensions, and where the inconvenience in contemplation is wholely inexcuseable, and, rigidly speaking, unnecessary. In the outward-bound voyage, and while the overloop is the appointed lodging of recruits, &c. it is frequently lumbered in such a degree with heterogeneous substances, as to incommode them most ungraciously; and this confusion and crowding sometimes prevent the possibility of the requisite cleanliness. In this manner, not only filthiness is encouraged, but, when the deck is embarrassed, the occasionally attempted ventilation is incomplete; or, as sometimes happens, when the middle of the deck is occupied with structures for keeping stores, there is at best always a lee-side, in which the air suffers stagnation, and becomes very disagreeable, if not prejudicial. Seamen have been accused of dirtiness and slovenliness, but here it may be said, that the recruits, or military, who are embarked for distant countries, are not more refined in their manners and habitudes, and from their ignorance of a sea-life, and their general idleness, they are commonly more unmanageable In some of these ships, even a considerable proportion of the cargo is sometimes thus placed upon this deck, and constitutes an annoyance to the inhabitants, and, also, if piled up to some height, or even in any manner, may, in unsettled or boisterous weather, become the cause of much danger; and, indeed, accidents have occasionally been thus produced. This alteration of more or less of the ship's loading, is instituted with the intention of trimming ship, as it is called, but seldom with considerable advantage. The middle distance of the orlop deck being rather above the central line of the principal movements of the ship, the change of weight will thus, instead of being beneficial, be often additionally inconvenient, not only as incommoding the recruits, as already mentioned, but by augmenting the unpleasant commotions. It would even be adviseable, that the officers and commanders of ships should acquire some knowledge of the adjustment of ships' loadings; and thus they might, at least occasionally, lessen the inconveniences. Those who have experienced the labourings (fas sit verbo,) of a ship in a tempest, will confess the propriety of any proposals which may tend to diminish distress and danger. From the inconvenience accompanying this accumulation of improper substances on the deck, and the little advantage ordinarily attainable, the practice can hardly be recommended.

XLIX. Many articles, which should be placed elsewhere, are frequently put on this deck; and this seems to happen especially towards the conclusion of the passage, when other objects become more interesting to mercantile speculators. This is another grievous mischief, and occurring at a time when its influence is particularly impressive. After the fatigues and numberless annoyances of a tedious passage, unaccustomed confinement, the operation of undue heat, the use of sea diet, amongst many of these unhappy fellows, depressing reflections, &c. they are now opportunely liable to the actions of every unpropitious circumstance. At this part of the course also, several, most probably, are in a state of weakness and exhaustion; either depending on the foregoing causes, or arising from the force of disease, or from a proclivity to indisposition, but perhaps not hitherto distinctly manifested. The closeness and dirtiness of this apartment are now particularly prejudicial and destructive, and all remedial intentions will be proportionately thwarted or disappointed. This unfriendly condition of matters at this stage of progression, generally a few weeks before the anticipated arrival, arises from carelessness in two parties concerned. The recruits, from a foreknowledge of their removal from their accompanying circumstances, become indifferent, expecting to be speedily liberated from their confinement; and those who superintend, on the other side, think that their responsibility will soon terminate; and thus the evils are aggravated from a concatenation of circumstances. This is a subject of some importance, both from considerations of humanity and those of expediency. Much might be said upon the subject, but here it would be rather extraneous, a generally applicable statement being considered sufficient; the additional examination must be transferred to more fortunate and interested adventurers.

L. The holds of ships should be carefully and repeatedly ventilated, and also all uncleanness properly removed from their surfaces; or, if considered to be occasionally expedient, which will in fact be adviseable, they may be white-washed with quicklime in the act of slaking. Those employed in the application, using every precaution for the avoidance of inhaling the vapours proceeding from the mutual action of the lime and water; or instead of this, the solution of the mineral alkali may be sometimes substituted. The quicklime is always easily prepared from limestone, or common chalk, &c. and the assistance of a crucible, some charcoal if thought to be useful, and vulcan's furnace. Cleanness, in the holds of ships, is scarcely ever sufficiently maintained; and in vessels employed for the purposes of traffic, inattention to this, and consequently filthiness, constitute some of their very blameable imperfections and annoyances. Whenever the holds of these vessels are unoccupied, they should be briskly scrubbed and cleansed in every corner where there may be a lodgement of nastiness, and at other times should be frequently and thoroughly ventilated with windsails or any other convenient contrivance. Neglect of keeping the holds of ships clean, is productive of more mischief than what is commonly apprehended. In these situations, large quantities of foul airs are constantly generated and disengaged, and which naturally and almost continually ascending by the hatchways, necessarily propagate some of their influence upon the decks inhabited by the ships' companies; and, in boisterous weather, when there is much commotion, and all the ports are closed, this evil must exist in a more extensive and injurious proportion. A considerable diversity of airs is thus constantly formed, and let loose in the hold, and afterwards mischievously disseminated. This inconvenience is most apt to be predominating when the practicability of its mitigation or diminution is least obtainable. The concentration of the misfortune is most remarkable and detrimental in calmness or stillness of the atmosphere, or when, as just said, all the port-holes, scuttles, &c. or perhaps even the hatchways, are in a state of operculation.

LI. The noisome airs, principally evolved upon these occasions, are carbonic, which, from its greater specific gravity, commonly occupies the lowest regions; hydrogene also, part of which is produced at the expense of the water in the ship's hold, or this species of air combined with various portions of carbone, carburetted hydrogene, and sometimes in conjunction with sulphur, phosphorus, &c. Chemists have ascertained the existence of three or four species of carbonate of hydrogene, (but the specification is rather indeterminate,) and some one of these is almost constantly one of those airs disentangled on shipboard. Some of the combinations of hydrogene are peculiarly offensive; and this air, in some of its modifications, is what renders what is called bilge water so disagreeable. Nitrogene, or thanatode, either singly or jointly, may, likeways, be injurious; and being a little lighter than the same measure of the atmosphere, its natural tendency will be upwards. This air is incapable of supporting combustion ; and it is, moreover, incapable of supporting life by respiration, or by itself it proves immediately destructive. The carbonic acid air is generally so diluted before its ascent to the level of the gun-deck, that there its more immediate influence is ordinarily not perceptible. This air is also unqualified for supporting combustion and animal life by respiration. It has already been observed, that from its comparative heaviness, it, in close places, chiefly occupies the lower spaces in such apartments ; and this applies to churches, theatres, prisons, garrisons, or confined barracks, holds of ships, &c. From the most probable estimates its specific gravity is almost 15 to 10; and, consequently, that although, from its dilution with the common air, it may not produce any evident or apparently immediate effects, yet it may induce some hurtful changes, slowly and imperceptibly. A complete enumeration and description of these aeriform substances, their respective characters, and generation, combinations, habitudes, and influences, &c. upon the human constitution especially, would involve a length of chemical discussion, in this place altogether intolerable. A more comfortable and satisfactory intelligence to commanders and commanded, is the confidential assurance that all these airs, by appropriate management, are removeable, or susceptible of such modification as not to be observably prejudicial. The unintermitted preservation of cleanness and ventilation will be sufficient for obtaining and assuring such commendable advantages.

LII. In the disquisitions upon the atmosphere, it was incidentally mentioned, that, occasionally, distempers are ingenerated, in particular circumstances, on shipboard; and, amongst others, those of an intermitting description sometimes make their appearance. That diseases should be produced from the improper condition of a ship, originating from carelessness, or insufficiency of knowledge, is, in these times, a subject not only of a lamentable nature, but seems to be unpardonable. As this is a consideration of unexpected importance, and especially in the warmer climates, where morbific effluvia are most speedily engendered; and, as a valuable collateral testimony, and strengthening affirmation, of what has been repeatedly suggested in these compendious disquisitions, liberty is assumed to insert the subsequent notifications contained in a communication from Dr. D. J. H. Dickson, in the forty-ninth number of the Edinburgh Medical and Surgical Journal: "Marsh miasma is generally and very justly considered as the grand source of the fevers of warm climates; but, though very frequently so, it is not necessarily always, or the only source of that in question (the Tropical Endemic, or Yellow Fever). While its operation has been too exclusively insisted upon by some authors, it has only been admitted under great limitations by others. The term, indeed, is not free from objection, since it has caused the latter to receive it in a sense far too strict and literal, and to question the existence of such exhalations, except in the vicinity of a complete swamp or marsh. I am at present to consider the miasmata of decomposition, with reference to their effect, and not to their intimate nature, in whatever situation they may occur; and, in this general sense, it appears to me, that, in a temperature so uniformly high as that of the West Indies, and where decomposition is so rapidly promoted by the agency of heat and moisture, there can be very few places where the occasional production of noxious effluvia may not be calculated upon on shore, and sometimes also on shipboard. Of fever arising, in particular ships, from impure exhalations, emanating from a foul state of the hold, continuing, notwithstanding, every attention to preventive measures, and ceasing only upon the hold being cleared, I have seen many well-marked instances. As the most unseasoned part of a ship's company, and especially strangers, will be most liable to suffer, in this case, it is easy to perceive that such attacks might sometimes be construed in favour of infectious fever; but, that they proceed solely from the source above-mentioned, appears to me clearly demonstrated by the previous inefficacy of ventilation and cleanliness,—by the impunity with which promiscuous intercourse, elsewhere, is maintained with other ships,—by the extinction of the disease upon the hold being cleared, and not till then,—and by its not being propagated or communicated by the sick, when removed from its original source.

LIII. " I shall adduce one example, where, from the peculiar construction of the vessel, the source of the febrific exhalations could be more clearly ascertained than when they arise from a foul state of the ballast in general. In April 1807, a fever prevailed in the Dart, lying, guard-ship, at Barbadoes, which, at first, was attributed to land influence, and irregularities committed by the men employed on shore; but as it continued, from time to time, to attack new-comers, especially after sleeping two or three nights on board, an internal cause became suspected. The ship was divided into compartments below, so as to allow of the water being carried in large tanks, or cisterns, instead of the usual manner; and these having been disused in harbour, their bottoms were found to be covered with an offensive deposition of slimy mud. On the 17th of May, cases of fever still supervening, I find by my notes, that this evil had been detected and remedied; and communications between the divisions had been opened, so as to allow a free circulation of air below; and, on the 24th, I find it stated, For the last week no fresh attacks of fever have occurred on board the Dart;" and he adds, " Impure effluvia will be most apt to be generated in a new ship, particularly if built of green wood; or where the shingle ballast has not been restowed for a length of time, or had not been, originally, carefully selected. If such exhalations (between which and animal effluvia, confined or produced by the human body under disease, a wide distinction obtains, though their effects have been often confounded,) be admitted to occur, occasionally, in a man of war, where cleanliness is proverbial, it is easy to perceive, that by the agency of heat and moisture, they may, under particular circumstances, in a transport or merchant-ship, become so abundant and concentrated, that the hold, without the expression being very figurative, might be denominated a ship-marsh." —These observations are of importance, and show what evils may arise from mistakes in, oversight of, and inattention to, cleanness on shipboard. In the warmer climates, the consequential inconveniences and misfortunes are more considerable, urgent, and speedy, than in those commonly reputed temperate. If it were not for the comparative coolness, and frequently coldness, in the northern latitudes, navigation would soon become enfeebled, if not exterminated, by the occurrence of distempers of the most indomitable and irresistible description. It is principally from cleanliness, ventilation, comparatively comfortable accommodation, and proportionate discipline, and progressive reconcilement in the Royal Navy, that, in these climates, even a moderate share of healthiness and usefulness is susceptible of continuance.

LIV. And here, also, it may not be irrelevant to observe, that it was customary, in many ships, to have the fire so placed, that more or less of the smoke might be diffused through the ship. This practice, so emblematical of confinement and noisomeness, was encouraged from the notion then prevalent, that smoke is serviceable in preventing not only the evolution of contagion, but also beneficial in conquering it when actually subsisting. Even the humane and intelligent Lind favoured this uncleanly and offensive practice; so that he considered it to be beneficial to ships' companies. At page 253, the following quotation from Lind, apparently favouring such a conclusion, was introduced: "When the Edgar, a ship of 60 guns, was upon the coast of Guinea, in the year 1765, her men were very sickly, and many of them died; whereas it was observed, that in a sloop of war, which was constantly in company with her, few were taken ill, and not one died during the whole voyage. This could be ascribed to no other cause, but that in the sloop the fire-place for cooking victuals was in the same level with the deck upon which the men lay; and every morning when the fire was lighted, especially when there was but little wind, the smoke from the cook-room spread itself over the ship, particularly over those parts where the men lay," &c.—This statement, at first sight, would appear to be almost convincing and conclusive; but, most probably, some other circumstances of importance should have been taken into the calculation. In general, it is not known that smoke is directly injurious, as is commonly and sufficiently illustrated in all those hovels in which smoke constantly surrounds the inhabitants. Perhaps the pyro-lignous acid, which is lately said to be so powerful in preserving animal substances when in a lifeless condition, may also have some saving effect upon the human constitution; but this is far from probable. Smoke, diffused on the gun-deck of a ship, or in any ship, or any place of a ship, is often harmful, especially to those with tender eyes, or who may be affected with pulmonary complaints. In this manner coughs and ophthalmic inflammations are aggravated, and the general condition of the people rendered very uncomfortable. In some constitutions, the smoke from some kinds of wood will occasionally excite so much irritation and coughing, as to terminate in sickness and vomiting; and redness of eyes has been frequently induced by smoky vaporations. In the present state of human science, it would appear adviseable, that smoke should always be excluded, both as offensive, and not altogether harmless; and its usefulness, in any case or situation, would seem at best extremely questionable. Under the head of cleanliness, therefore, smoke should be deemed as an extraneous and unpleasant intruder, whose expulsion, or rather total exclusion, should constitute a part of this defensive and preservative department. Although a French chemist may pretend to make mummies by means of smoke, or the pyro-lignous acid, yet there is no proof that these substances will have such a conservative influence upon the living human constitution.

LV. Ships which are not liable to much leakage in the tropical latitudes, or the warmer weather, are more fruitful in the production of injurious and offensive effluvia, than those which, by admitting more water, have what is contained in their bottoms more frequently removed by pumping. The entrance and removal of the salt water, and also its commotion, act as a hinderance to the putrefactive decomposition. And farther, it may be observed, that those evils arising from putrescence, &c. are more especially prevailing in those ships, in which all the washings of the deck, destined to the accommodation of the ship's company, instead of being conveyed entirely from the ship, pass among the timbers to the bottom. This mischief must occur in all those vessels which are constructed without scuppers for carrying off the scourings. As these washings contain all the removeable or soluble filthiness of the deck, &c. if they are permitted to continue at the bottom of the vessel they become peculiarly offensive and abominable. Carburetted and sulphuretted hydrogene, and carbonate of oxygene, &c. variously combined, &c. are commonly disengaged and evaporated. These horrible and pernicious exhalations, ascending among the timbers, are afterwards dispersed from the different apertures, and they issue from the hatches in voluminous quantities. When the weather is moderate, and the customary openings continue unclosed, the officer who occupies or reposes in a confined cabin, commonly first experiences some of the consequent annoyances. His cerussated painting and gilt buttons are blackened or discoloured, and he himself, moreover, perceives a confused assemblage of anomalous symptoms, such as headache, transitory giddiness, sickness at stomach, &c. If these inconveniences cannot be obviated in any other manner, a quantity of sea water should be, occasionally, let into the ship's bottom, and then abstracted by pumping. This occasional washing of the ship's hold may be preventive of some harm, and, even upon ordinary occasions, will keep the ship more comfortable and wholesome. Adviseable it appears to be, in all ships of what kind or size soever, to counteract any unnecessary accumulation of the bilge-water; and if, from the appearance of particular circumstances, it should, at any time, be judged commendable, the ship's bottom may be washed in the manner mentioned. This proposal, apparently paradoxical, will be most applicable to those vessels, which, to borrow a marine phrase, are not leaky.

LVI. Another piece of structure, intimately connected with the subjects under discussion, is the well of a ship, as it is customarily denominated; and which requires more attention than what it commonly receives. Deleterious airs, especially the different combinations or modifications of the carbonic acid, are herein copiously engendered and disentangled; and have, through incaution, ignorance, or hastiness, proved frequently destructive. Occasional purification of this contrivance is invariably necessary, and it should be sufficiently freed of all its foulness. An application of quicklime, as commended for the ship's hold, may sometimes be serviceable; this may operate by absorbing the carbonic acid, which, in this part of a ship, is so commonly generated, and may be prejudicial. For obtaining the full benefit of this plan, it would require to be often repeated. The preserving the inner surface of this piece of structure as dry as possible, is also a consideration of importance. Ventilation of the well should be duly conducted, and this might be done with a pair of large bellows, &c.; and swinging stoves should be sometimes introduced, for the evaporation of all dampness. If the well is thus frequently ventilated, white-washed with quicklime, or occasionally washed with a solution of soda, (strictly so called,) with the necessary attention to its dryness, those who may have occasion to descend into it, need not be apprehensive of evil consequences. At every subsequent expurgation of the well, any accidental incrustation can be removed, and thus the surface will be more suitable to the adaptation of the succeeding purification.

LVII. At this stage of these desultory remarks, it may not be altogether irrevelant to introduce the subsequent reflections of one who has treated expressly on subjects intimately concerning the condition of the seafaring. " A substance occupying the bottom of a ship's well or hold, has been long known in our navy, from its frequently suffocating the carpenters employed about sweetening a ship. No designation before our own was given to this substance, nor was its production accounted for. It is only by pneumatic chemistry that it is capable of explanation. We have ventured to say, that it is *carbonic acid gas*, otherwise called *fixed air*, *choak damp*, &c. That this is the lethalic vapour of the well, may be easily proved by experiment. It can be brought up in a bucket, and may be poured from one vessel to another; its properties are, to precipitate lime from lime water; when mixed with water, it imparts to it an acid taste, it turns the blue tincture of vegetables red, like all acids. The specific gravity of carbonic acid gas, in proportion to common air, is as 150° to 100°; it therefore falls to the bottom, and occupies the lowest stratum whenever it is found, &c.—The production of carbonic acid gas, is to be explained in the following manner: when water is allowed to remain in contact with the timber of the ship, a mutual attraction takes place between their constituent principles. The water is decomposed, and supplies oxygene, one of its parts, to the charcoal, or carbonaceous matter of the wood, which, as we said before, forms carbonic acid gas. While this combination is going on, between the oxygene and coal, the other component part of water, which is hydrogene, is disengaged; and, as it is very much lighter than common air, it rises upwards, ascends among the decks, by attracting caloric, it becomes a gas; and gives to the nose the bad smell which we perceive when the well is foul. This is the bilge vapour; its specific gravity is about 15° to 1° of common air, being the lightest of all elastic fluids, and for that reason used to fill balloons. It is called *fire-damp* by miners, because it is easily set on fire, and often destroys them. Seamen, employed in the hold, are familiar with it; and amuse themselves by taking out the bung of a cask of stinking water, and set the vapour on fire by a candle. It mixes, in certain proportions, with water, and gives it the disagreeable taste and smell. It changes the colour of white paint to a black, which is often observed in ships. White lead, of which the paint is made, is lead oxydated, that is, lead combined with oxygene. Now the hydrogenous gas, or bilge vapour, which rises out of the well, or hold, attracts the oxygene from the white paint, which immediately becomes a metal, and loses its colour. This quality of altering the paint, and the fœtid smell diffused throughout the decks, will always indicate that the hold, or well, are, (is,) in an unwholesome state; because, in proportion to the hydrogenous gas, which flies upwards, a large portion of the deadly vapour, the carbonic acid gas, or fixed air, will be found in the bottom of the ship. Carpenters must be very cautious how they venture into the well at this time. It is proper to let down a candle in a lanthern; if the light goes out, it is death to decend."—All this is stated upon the confidence that simple hydrogene is the object of attention; but, in these circumstances, it is probable that it never occurs but in a state of combination; as is easily understood by any one acquainted with chemical principles.

LVIII. "When any substance liable to fermentation, comes in contact with moisture in a ship's hold, the generation of impure air is the inevitable consequence. All vegetable substances, mixed with ballast, may have this effect. Great care should therefore be taken, that nothing but clean pebbles be admitted there. Green wood, whether for fuel, or for stowing casks, is of this description. When small beer puncheons, sugar, or molasses, happen to be stove, (staved,) and leak, they much increase the production of impure air, by favouring the decomposition of moisture.—Most people have perceived the very offensive smell of bilge water after a cask of spirits has been leaked out in the hold. This sometimes continues long, and is difficult to be got the better off; (of,) but the best method of cleaning, is to throw in abundance of pure water to carry off the spirit. All kinds of spirits yield a large proportion of hydrogene, or the base of inflammable gas, which gives out the offensive vapour. This is the substance that affords the horrid fœtor to the breath of the dram or grog-drinkers, who are known to have, sometimes, undergone combustion, or burning, during life.—The provisions which afford the most disagreeable exhalations, are cheese and butter when they grow rancid. Cheese is very much disposed to putrefaction, which is greatly increased by the heat of the bread-room, where it is usually kept. Plain as this observation is, yet so little has service improved from experience, that there is scarcely a ship that does not condemn a quantity of cheese three or four times a year. All this might be prevented by keeping it perfectly dry, and well aired, while in the storehouse on shore, and by airing it often in dry weather upon deck.—Nothing has been so offensive on our decks as pig-styes. I am glad to find that Lord St. Vincent has ordered them to be removed into the waist, to make room for the sick-birth. Our opinion has been long at war with these nuisances: officers ought cheerfully to give up a few messes of fresh pork to their stomachs, to let their lungs have the full benefit of pure air in their sleeping and waking hours.

LIX. "There is another very filthy practice in ships when in port, of hanging their fresh beef under the half deck, or under the booms in the waist. It is in those places exposed to the breath of the whole ship's company, and is often brushed by them as they pass. The sight is extremely disgusting. I think some plan might be fallen upon to hoist it up under the main yard, and to cover it, above, with some kind of awning or safe.—It has been seen what pernicious effects are to be expected from water being allowed to stagnate, in contact with timber, in the hold or well. But the same takes place, more or less, in the upper decks, whether wetted on purpose, or by water getting over the ship's gunwale, or in at the ports. We have often seen this baneful practice of washing decks persisted in, till the very planks became green with vegetating substance, and appeared like the inside of a tank, or the bed of a pond. Nay, a surgeon of a seventy-four gun ship, lately complained to me, that, in the middle of winter, the main and quarter decks were washed every *evening;* and of course, from the low temperature of the weather, could never be dry. The effects of this custom, that savoured equally of ignorance and cruelty, was (were,) quickly observed amongst the crew. A long list of catarrhs, rheumatisms, pleurisies, and low fevers, was the consequence; which only disappeared after a considerable number of deaths, on the approach of summer weather.—It ought to be understood by our officers, that timber can only decay by the application of moisture. They know well that a ship built of green wood; that is, what they commonly denominate unseasoned timber, will not last so long as one made of well prepared materials. This difference entirely consists in the unseasoned wood being cut down while the tree is full of sap, in order to separate the bark for the purpose of tanning more easily from the wood. The speedy dissolution, therefore, is owing to the quantity of humidity contained in the sap vessels, which chemically acts upon the timber, and is re-acted upon again. During this combination of principles, different airs, gases or aërial fluids are generated and disengaged, till the log or plank is wholly converted by something like a slow combustion into rotten wood, which very much resembles carbonaceous matter.

LX. "We thus see that water only is as it were the *solvent* of wood: if preserved from moisture, it might be said to keep for ever. A deck like other pieces of deal, will appear perfectly dry to a common observer, but if put into an alembic, over a fire, it will soon discover a large proportion of water that issues from its interstices, and is converted into vapour by the heat. But besides the production of impure air, and rotting the timber by drenching it with water, chemistry unfolds another secret, by which it is hurtful to the living body. There is no seaman so ignorant, but he knows that fogs are bad for health ; that they produce colds, rheumatisms, &c. Now, a sailor sitting or standing on a wet deck, is exposed to a constant fog, by the water exhaling from the plank; he is involved in a perpetual mist till it becomes dry. In a situation of this kind, some people will tell you that you are apt to catch cold in the feet. But not the feet only, but the whole body suffers, and is apt to have its perspiration checked; for the space which it occupies is some degrees colder than other parts of the air, by the quantity of heat that it takes to convert the water into vapour. It is literally exposure to a cold bath for a length of time; and its effects are exhibited accordingly, by the complaints which it causes. But in the night watches, the baneful effects of wet decks are chiefly observed. If a seaman, from being intoxicated, over-fatigued, or otherwise, lays himself down on the decks in this moist state, and sleeps, disease of some kind, bowel complaints, catarrh, rheumatism, &c. immediately follow. An attentive officer will, therefore, be cautious how he allows his watch to loiter about the decks, whether after washing in wet weather, or at any time when it is unusually cold. During sleep the body is extremely susceptible of cold. Amusing them, therefore, by every means, in a night-watch, to keep them cheerful and active, is highly conducive to health."

LXI. "With respect to preventing the generation of foul air, the fixed air, or *carbonic acid gas* of modern chemists, in the hold or well, there are various means practised in different ships. A perfect knowledge of its chemical qualities, explained above, very much facilitate the nature of this duty. The hold of a ship can seldom be kept so dry as to generate no fixed air; if the bottom is completely tight, the leakage of casks, or water falling from the deck, will generally afford moisture for this purpose. Hence many officers direct fires to be kept in the well frequently, and the well itself to be inspected often, and swabbed dry. This will often answer the intention; but sometimes there is so large a production of the foul air, that other means must be put in execution. It is found that carbonic acid gas mixes very readily with water; and, in this manner, clean water being let into the well, soon takes up the whole, while at the same time it washes away all the stagnating filth and moisture which are undergoing decomposition, and which, otherwise, would prove an endless source of the noxious vapour. If the cock is stopped, or the pipes admit no water, by throwing it from buckets, or sprinkling it gradually into the well, the same purpose is answered. Quicklime being mixed with this water, would do it still sooner, because it quickly attracts the air.—In sickly conditions of ships, it is a common practice to wash the decks and timbers with vinegar, as well as the sick-birth. The practice is certainly a good one; but it is a better method to sprinkle it very gently on the deck, than to evaporate it by means of fire, or hot iron. The oxygene air which gives acidity to the vinegar, is disengaged, in a gradual manner, during a slow evaporation, and thus adds to the pure and respirable portion. But vinegar must never come in contact with white paint or whitewash. The first it converts into sugar of lead, and the latter into acetate of lime. It therefore changes both, and thus renders the timber more liable to attract moisture, and become damp. When fires are let into the well, for the purpose, as it is said, of expelling the foul air by rarefaction, care should be taken not to let them at first to the bottom, lest they should be immediately extinguished; which is always a proof, that the stratum of air would quickly kill a man. We are, however, of opinion, that the best method is to let pure air in as often as necessary: this must be regulated by the cleanliness of the hold otherwise, and what may encourage the decomposition of the moisture. In warm climates, and in the summer season, attention to this duty is more required; for water always stagnates sooner in hot weather than cold; so much does heat assist the decomposition, and consequently the speedier production of the foul air."

LXII. Sometimes accidents happen from incautiously descending into the well, or other part of a ship in which different modifications of the carbonic acid air may have been collected; and of these the carburetted hydrogene, in such situations, is in all probability, commonly the most predominating. Dr. Murray remarks, "There are obtained, in various processes, inflammable elastic fluids, which, in their combustion, afford water and carbonic acid in different proportions; and which are therefore compounds of carbon and hydrogen, or of carbon, hydrogen and oxygen; and as such, may have the common name of Carburetted Hydrogen, or Oxycarburetted Hydrogen, applied to them. There is much difficulty in determining their composition, and there is even considerable uncertainty with regard to their specific distinctions. Two definite compounds appear to be established, both composed of carbon and hydrogen; and which, from their relative proportions, may be distinguished by the names of carburetted and super-carburetted hydrogen. Some chemists consider all the other gases of this family as mixtures of these with hydrogen and with carbonic oxide; while others maintain, that carbon, hydrogen and oxygen, may combine in more numerous proportions, and that some of these gases are ternary compounds of these elements."—After mentioning some circumstances in reference to these gases, he states, that "The first gas of specific composition, and to which the name of Carburetted Hydrogen is more peculiarly appropriated, is one not obtained by an artificial process. It is the elastic fluid which arises from marshes, and which is evidently produced from the decomposition of vegetable matter.—Besides the two compounds of carbon and hydrogen now described, there are a number of other elastic fluids containing these elements, the precise characters and composition of which are not so easily determined. The gas of this kind which has been longest known, and which, indeed, is the first that was discovered, is obtained in the decomposition of water by charcoal at a red heat. The gas which is expelled from charcoal alone, by heat, appears to be of a similar nature. The gas from humid charcoal is eminently fatal to animal life. Breathed pure, it occasions immediate death; and diluted with 20 parts of atmospheric air, it is strongly depressing: it reduces the force of the circulation, causes nausea and vertigo, and, if breathed too long, suspension of the vital functions,—effects probably owing to its chemical action on the blood."—The examination of this subject would be of importance, as applicable to the inhabitants of ships, garrisons, and many other places in which they may unavoidably be subjected to the influence of these injurious exhalations. But here the considerations must relate especially to shipboard. As in this latter situation, the misfortunes originating, most commonly, occur on going into the well, it should, therefore, be previously and adequately ventilated by means of a pair of large bellows, or some such contrivance. The prevention of mischief is thus cheaply obtained; and the occurrence of fatal accidents, through carelessness or inconsideration, is always painfully afflictive.

LXIII. Seamen frequently suffer more or less inconvenience from foul air in the holds of ships, without deadly effects; and these evils should always be guarded against as much as possible. When explaining and illustrating the general principles of ventilation, some remarks will be offered on the propriety of purifying the holds of ships, when the men are put into them for any kind of business. As, in misfortunes of this description happening on shipboard, it will commonly be easily understood from what causes they may have commenced; so a laboured consideration of the phænomena, mode of management, seem here to be unnecessary. Struve, on the subject of suspended animation, makes the following remarks on " Suffocation by *Mephitic Vapours. External appearances:* Head, face, and neck swelled; eyes propelled from their sockets; the tongue protruded, and inclined to one side of the mouth; insensibility; the appearance of a profound sleep; the jaws firmly closed; the face livid; lips of a dark blue colour; and the abdomen inflated. *Signs of returning life:* Foaming at the mouth; shivering of the whole body, particularly after being sprinkled with cold water."—A complete enumeration of all the symptoms presenting either contingently or necessarily, in different instances of apparently suspended animation, or asphyxia, from the action of foul air, (the poisonous air must always, in these cases, be more or less diluted, otherways it would prove almost instantly destructive,) and attempting a distinctive examination of all the circumstances, would here require too extensive disquisitions; and reference may be made to the histories of individual examples of accidental suffocation. And, as being in point, and at same time exemplifying a scientific plan of treatment, the paper of Dr. Babington, in the first volume of the Transactions of the Medico-Chirurgical Society of London, may be recommended. First treatment, mentioned by Struve: "1. The windows and doors opened. 2. Immediate removal of the subject into the open air, or an aired room, the windows of which must remain open. 3. The body undressed, and all pressure immediately removed. 4. It should be supported, in a leaning posture, upon a chair. *Resuscitatives:* 1. The subject should be covered with flannel or blankets. 2. The face sprinkled with vinegar. 3. A bath prepared for the feet, or the whole body. 4. The face and pit of the stomach sprinkled with cold water, either by pouring it out of a glass, or squirting it by a syringe. 5. Friction with soft brushes, dipped in oil, must be applied every time the process of sprinkling is performed; after which the subject should be left undisturbed for some minutes. 6. Clysters of vinegar and water. *Remedies to be applied on the return of life:* 1. The use of the before-mentioned resuscitatives, such as vinegar applied to the nostrils, clysters and gentle friction, are to be continued. 2. An inclination to vomit promoted by a feather dipped in oil. 3. When the patient is able to swallow, vinegar and water, or mint and balm tea, may be administered. Resuscitatives to be applied in particular Cases: 1. Introduction of air into the lungs. 2. Venesection. 3. Bronchotomy. 4. The earth-bath."—The following are proposed as "Precautions to be adopted in rescuing Persons from *Subterraneous Places.* The assistant of such unfortunate people should first drink a little brandy, then put in his mouth a sponge soaked in vinegar; and before he descends into the pit, cover himself with wet clothes. A double rope ought to be tied round his body, passed under his arms, and secured behind: he should also be furnished with another rope, for the purpose of giving signals. *Manner of purifying the Air in damp Apartments:* This may be effected by burning gunpowder in a room; by a straw fire kindled at its entrance; by pouring cold water over the floor; or placing on it a few bushels of lime recently slaked, and diluted with an additional quantity of water. If pits are to be purified, the mephitic vapours, or fluid at the bottom, should be frequently stirred with proper hooks and poles. No person can with safety descend into a pit, when a burning candle, on being conveyed to the bottom, is suddenly extinguished.

LXIV. "The employment of fires for purifying the decks and holds of ships, is a very ancient practice; but cannot be defended, by a proper knowledge of the subject, without qualification. A more correct philosophy teaches us, that fire consumes pure air, and renders the remainder more unfit for respiration, in proportion to the quantity necessary to support combustion; for respiration and combustion can only take place where there is a due supply of the oxygenous portion of the atmosphere. A fire is, therefore, to be considered as destroying as much air as a certain number of living beings would do in the same time. A much better way of accounting for the good effects of fires, is their power of drying up moisture. We have concluded, that moisture thrown upon the decks, or in any other way coming in contact with the timbers, is one of the chief causes of impure air being generated. Fires, as tending to dry it up quickly, must therefore be beneficial; but we can in no other way account for their purifying the air, unless, by rarefaction of heat, a new column flows in; for the fire gives out nothing salutary. But there is another way in which fires are useful, whether in damp and cold weather, or when infection prevails in a ship; that is, by supporting the heat of the human body, which is highly necessary in the winter season, when low contagious fevers are most prevalent. In such situations, the large stoves and hanging-fires become requisite, by supporting the excitement of the body; and in this manner we consider them as preventives of infection; for warmth, in all its forms, provided you breathe a pure air, is a chief support of animal life."—With occasional allowances, these observations of Trotter's are sufficiently illustrative, and collaterally affirmative, of the general nature of those circumstances, which are specially of importance in this part of these miscellaneous animadversions. The knowledge of the possibility of manifold evils originating from foulness of ships—not only of their decks, but likeways from uncleanness of their holds, and the noisome vapours which are often generated therein—should operate as powerful arguments with all concerned, interested in, or responsible for, the welfare and safety of seamen, and implicating considerations never to be disregarded on the footing of neglectfulness.

LXV. It is not unworthy of observation, that, in ships returning from foreign voyages, very frequently a variety of insects, vermin, reptiles, &c. is contained; such as ants, cock-roaches, mice, rats, &c.; and these are often, designedly or accidentally, destroyed, or killed by starvation, or the occurrence of diminished temperature. The lifeless remains of these continue in different parts of the ship; but, most probably from gravitation, they ultimately fall into the lower places of the vessel; and there, consequentially and naturally, pass through the different stages of decomposition, and conclusively into putrefaction. Continuing these operations, different effluvia will be disembodied, and dispersed among the portion of air in the neighbourhood. These substances must also gradually undergo solution in the water commonly contained in the ship's bottom; and consequently every circumstance thus conjoins which may contribute to the speediness of putrefac tion—animal and vegetable matters combine with moisture; and if in the tropical climates, or the summer season of northern latitudes, high temperature, such as from 60° to 90°, also acts very powerfully. In the continuance of a prolonged voyage or stay in the warmer climates, these circumstances might be productive of considerable inconvenience, if their effects, or perhaps rather their operation, were not powerfully counteracted by the influence of the salt water which is constantly gaining admittance. But this is not altogether a veritable and conclusive argument; for it is said, that a small quantity of salt or saline matter, rather hastens than retards the work of putrefaction. The water, after having received a part of these animal matters, is afterwards carried off by the operation of pumping. This circumstance apparently strengthens the propriety of admitting a sufficient quantity of sea water for answering this purpose. When it is known that the putrefaction of vegetable and animal matters is going on in the hold of a ship, and disengaging unwholesome evaporations plentifully, fresh water should be freely introduced, and then pumped out; and, in company with this procedure, the hold should be carefully and extensively ventilated.

LXVI. As the generation and evolution of foul airs are unavoidably and continually proceeding, their counteraction, or dispossession, will therefore demand the requisite attention. In all vessels carrying the different articles of merchandize, provisions, &c. great care will be necessary in keeping their holds clean, and sufficiently disengaged from all nastiness of every description. The observations which have previously been suggested concerning the propriety of cleanness in ships' holds, should not be overlooked; although it is well known, that it is a subject which is, almost invariably, disregarded. The holds of ships should always be generally and carefully cleansed before stowage, and should, continuing voyaging, moreover, be occasionally ventilated. All those parts of a ship in which provisions are contained, require particular attention. "The new arrangements of the store-rooms in the fore cockpit, which admit of a free passage along the sides of the ship, as also in the cable-tiers and store-rooms abaft, are admirably adapted to preserve a pure ventilation, besides the cleanliness and order of the whole. Without the store-rooms and wings being arranged in this form, it is difficult to ventilate a ship below. Great care should be taken, that the ballast received on board should be clean, fresh, and as good in its kind as can be procured. The Thames ballast is very unfavourable to health; for, besides being naturally foul, it is full of fresh water animalcula, which, being destroyed in the ship, stink and become very offensive. It is sometimes the practice to line the gratings of the horlop with thin deal, to prevent any filth from falling into the hold: but it is a method highly pernicious; for the preclusion of air which is thereby occasioned, fills the hold with putrescency, induces dreadful disease amongst the people, and destroys the ship. Every method, therefore, should be taken to cause a circulation of fresh air in the hold, by the use of windsails, and occasionally by fire."—In some trading vessels, it is customary to secure the hatches, in such a manner that it is hardly possible for any ventilation to take place in their holds. This is the case in some of the Indiamen, as those carrying tea, &c. home from China to England. The substances employed for ballast, therefore, of vessels, would generally need some consideration; for, if they contain putrescent (or matters susceptible of putrefaction,) vegetable or animal materials, they may be productive of inconvenient consequences, and principally if the ship is proceeding in a foreign voyage, which consequently often anticipates the intervention of augmented temperature. The ballast of ships should consist chiefly of clean stones, or gravel well washed from all putrescent impurities. The ballast principally used in the East India Company's ships is mostly cast iron, and is, therefore, not immediately accuseable.

LXVII. The following quotation, from Dr. Trotter, will illustrate the prodigious pitch to which foulness of ships' holds may arrive in some circumstances, and the particular attention requisite in maintaining the requisite degree of cleanliness: "Captain Grindall left the Colossus at sea from bad health. In a letter from Plymouth, he informs me, that two patients sent to the hospital there died, another died in the Sound, and several while at sea: but the condition of this ship, when he took the command of her, was particular. The Colossus was the flag-ship of Rear Admiral Pole, and sailed with the unfortunate squadron under the command of Sir H. C. Christian, which was obliged to return, from contrary winds and severe weather, after being eight weeks at sea, in February. The lower deck-ports could not be opened during this time; and, from the motion of the ship, and water shipped in the gales, the provisions and other articles had been spread about the hold, to the quantity of forty or fifty ton, according to Captain Grindall's report, before the ballast was exposed. The consequence of this was, the production of an atmosphere in the hold and well unusually foul: no doubt, owing to the fermentation of the provisions, and the decomposition of the moisture. The officers and seamen employed in clearing the hold, were grievously afflicted with swellings about the submaxillary glands, and violent ophthalmias; and were obliged to be relieved by others during this duty: sometimes there was a necessity of standing fast, for some days, that the noxious vapour might be expelled. This account is interesting: but the fever certainly sprung from other causes, and was brought on board by the people. It is a little singular, that the hold of the Glory, which was Admiral Christian's ship, was extremely foul, and had not been cleared when the fever made its appearance there. I should have recommended the Glory to have been cleared, had she not been under sailing orders: but even in her, the fever originated from contagion imported; otherwise it could not have been so completely overcome: the ships returned from sea, report the Glory in perfect health. But it is a part of our means for destroying infection, to clear and dry the hold; and on that account, I have been more minute in this detail."—The vapours which had thus been generated in the hold, seemed to have considerable influence upon the human system. The effects displayed upon the salivary glandules, would lead to the conclusion, that some poisonous matter, in a subtle condition, was finding its way into the constitution. The ammoniacal vapour, and some others, have great effect upon the eyes, and might produce tenderness, and consequent inflammation, &c.

LXVIII. Mischievous consequences may manifest themselves not only from the exhalations proceeding from animal and vegetable substances, in a state of decomposition or putrefaction in the holds of ships; inconveniences of considerable magnitude may also originate from metallic substances, in such a state of comminution, or constitutional arrangement, as to be fit to be communicated. In this respect, danger arises from some of the metallic preparations employed in painting; and of these, lead and copper, as being most commonly used, are most liable to prove prejudicial. This, among other reasons, also is a powerful argument against the vague use of the acid fumigations. But what is still more remarkable, mischief has been done by metallic vapours, and their influence otherways imparted, even in a ship's hold; and at first their effects, from being unsuspected, were inexplicable. The mercurial influence has thus been conveyed into the human constitution. The following statement illustrates and exemplifies such an occurrence: "Considerable quantities of quicksilver were on board the ———, a certain quantity of which escaped from its containing vessels; which accident most probably occurred from some gales experienced off the African Promontory; whereby the ship underwent violent rollings and severely irregular agitations. The quicksilver was, therefore, exposed to atmospheric operation for at least two months, in a temperature of 90° to 100° of Fahrenheit's thermometer, which circumstances, conjoined with the perpetual undulations and concussions of the ponderous mineral upon the surface of packages, &c. eminently conspired to the oxydation of the metal, or reducing it to a Black Calx.

The people employed to discharge the ship's hold, began, in the course of 24 to 48 hours, to be affected with painful sensations along the maxilla inferior, about the fauces, in the direction of the trachea, especially the larynx, and pulmonary irritation likewise occurred in some examples, attended with the feeling of constriction and uneasiness in the epigastrium. The primary example which applied for assistance, indicated such anomalous symptoms that they could not possibly be referred to any known genera morborum; rather exhibiting the appearances generally produced by the inhalation of some of the poisonous gases: *e. g.* Nitrous oxyde Gas, Azote, Hydrogene, &c. (It must here be understood, that these airs have been more or less diluted before inspiration.) But the lapse of twenty-four hours indicated evidently the operative excitation of these previously inexplicable symptoms. The peculiar fœtid breath, ptyalism, irritated pained gums, swelled (swollen) cheeks, with the interior surface of them ulcerated in the direction of the rows of teeth, &c. plainly evinced the powerful operation of mercury upon the system. The proper effects of the quicksilver were generally produced in the course of twenty-four to forty-eight hours. The accession and positive condition of symptoms were modified by systematic susceptibility, either originally existent or accidentally acquired. One fellow who had been frequently salivated for syphilis, was affected to such a degree, that it was judged expedient to administer de-oxygenizing substances, and restringent gargles, &c. About twelve or more Europeans have undergone the Mercurial Influence. Those men engaged above decks remained completely exempted from its operation; and those employed about the hatchways were very slightly affected. The Asiatic Natives were not excepted; but those people being frequently changed, its operation upon them seldom extended to complete salivation. The Reporter assumes freedom to explain its introduction into the system in the following manner. The air in the ship's hold was almost indubitably imbued with mercurial effluvia, which were constantly inhaled by the operation of respiration; portions of the oxydized metal, or Calx, were very probably dissolved by the saliva, which is known to possess wonderful influence in preparing the mineral for producing its peculiar effects upon the body, &c. and thenceforth transmitted to the stomach, &c. Cutaneous absorption afforded another inlet; the soles of the feet, and palms of the hands, &c. being oftentimes in contact with it. The foresaid curiously attractive, and extremely infrequent occurrence, suggests manifold materials for philosophic reflections; and perhaps, ultimately, highly useful methods of Practice. The mercurial atmosphere would appear to be the speediest and most powerful method hitherto invented (or rather fortuitously manifesting itself) for the application of mercurial preparations; which perhaps may be particularly compatible in Tropical Climates, and thereby be serviceable in Tetanus, Hepatitis, &c. where practitioners so generally, and so largely, but frequently extremely improperly, employ the foresaid medicine. An apparatus capable of containing the mercurial effluvia, and constantly supplying them, might readily be devised; (such a thing has been done;) and by having such a receptacle connected with an hospital, the patients could thereby be thoroughly, and probably usefully, exposed to its operation. The salivary glandules in the forementioned people, appeared more strongly affected in FORTY-EIGHT HOURS than can commonly be obtained in eight or more days."—The possibility of such an occurrence should be remembered, and the practitioner prepared for circumstances, however remarkable, and sometimes unaccountable. The foregoing statement is of indisputable authenticity, having been demonstrated to immediate observation.

LXIX. That a vessel may be actually maintained in a sufficient state of cleanness, it appears, from these scattered observations, that not only personal cleanliness, but of clothes, bedding, and even of ships generally, is absolutely indispensable. But something further is necessary; for many ships, which would appear cleanly to a superficial observer, are nevertheless not clean throughout; for if the men's repositories were examined, foul and noisome articles would be found. Ships' crews should be prevented from collecting dirty clothes in bags, chests, &c. as is too common; for these unclean articles are offensive, and may even become harmful. And thus the removal of all nastiness, and of all impurities, will constitute the possibility of enjoying the comforts and benefits of cleanness, with all its beautiful and beneficial consequences. It has already been mentioned, that the overloop decks of Indiamen, are frequently not kept in a sufficient state of cleanness, even while they are allotted to be habitations of soldiery moving towards the oriental territories. In moderate weather, however, it is conceived that these decks should be subjected to the operation of washing and scouring in all their surfaces. The operation of cleansing by ablution, in the warmer weather of any climate, and in the tropical latitudes, almost constantly, or any time when necessary, is undoubtedly commendable. The cleansing and washing of these decks, therefore, may be accomplished as frequently as requisite; and, excepting in extraordinary dampness of the atmosphere, (of which a well-contrived hygrometer will be a tolerable criterion,) all wetness will soon be evaporated; and this process may commonly be greatly promoted and hastened by stoves and windsails, in a state of convenient adjustment. Or if suitable machines are furnished, for containing combustible substances for evaporating any remaining humidity, and accompanied with ventilation, the proposal of washing this part of a ship is not susceptible of any irrefragable contradiction. These suggestions must be regulated in their application, the frequency of repetition, &c. by the prevalence and modification of circumstances. It has been mentioned that recruits are generally awkward; not only so, but they are unskilful in those things which may concern even their own welfare; they are likeways frequently sluggish, and continual attention is necessary for preventing them from falling into mischief when collected, or when not employed. They very often, for want of seats, recline themselves on the deck; and when this is damp or greasy, mischief and disease are thus often produced. The consequences may not be immediately perceptible; notwithstanding, in the course of a long passage, the discerning practitioner will have frequent cause to bewail the effects of inconsideration, and the awkwardness of circumstances.

LXX. The universality of cleanliness is commendable; or, what is more, and of more extensive importance, it may conscientiously be considered as indispensable; and nothing should be thought below the dignity of the officer, who is sincerely animated with a desire to the maintenance of comfortableness, and the conservation of healthiness. Every spot of a ship which may become the lodging of filth, must be examined, and, if necessary, be properly purified; for unless the practice of keeping clean be generally diffused, the benefits expected will be proportionally thwarted and prevented. The temple of Cloacina must not be indignantly unobserved or disregarded; the department over which the goddess presides, also requires its proportion of cleansing management. In intelligible and expressive language, the places appointed for intestinal evacuation should be frequently subjected to the operation of expurgation, by scrubbing, ablution, &c. In the tropical climates these mundatory processes should be regularly performed morning and evening; and this will be more especially adviseable, where many persons are frequenting the same necessaries. By inattention to sufficient cleanness, they frequently become offensive by their unpleasant and otherways mischievous exhalations. It is not impossible but that some complaints may thus be communicated by *contact*, or immediate contiguity. It is not altogether improbable that some bowel complaints, dysentery for instance, in some of its modifications, may thus be communicated. In all crowded ships, such as transports, ships of war, &c. therefore, particularly, in which a promiscuous assemblage is so frequently and commonly in a state of confinement, some attention to these circumstances is here warrantably and necessarily recommended.

LXXI. No circumstance, having a principal reference to the management so continually requisite to the preservation of healthiness of sailors, should ever be overlooked. Even the vessels for containing or preparing their victuals must be kept in a state of sufficient cleanness. They are of themselves generally very inattentive to this, which should always be considered as a matter of the greatest moment, as being essentially necessary to their healthiness.—The places for cooking are spots in which there may exist grievously prejudicial imperfections. These apartments should be occasionally inspected, and at uncertain and previously unrevealed intervals; and any inattention to cleanliness, coarseness of management, &c. should immediately be counteracted, and reformation instantly introduced. The plausibility of general appearance will not suffice; the whole apparatus or appertinents, used in this department, must be kept in as high a degree of cleanness as possible. And to improve the business, and preclude, as far as practicable, all hazardous consequences from improper and deleterious substances—instead of vessels made of copper, &c. iron pans, boilers, stoves, ovens, &c. should be substituted. The iron utensils, if kept clean, will impart no poisonous properties to the alimentary substances therein prepared; which those formed chiefly or wholly of copper, and not properly cleansed, may certainly communicate. The utmost attention should be always bestowed on this part of the subject, for although disease may not, in many instances, be immediately or directly produced, yet manifold anomalous and unpleasant symptoms, may be the consequences. And what should not be forgotten, is, that the cause may not be suspected, and therefore allowed to continue to operate unrestrained. Affections of the head, stomach, and bowels, may thus be induced, or the general effects of some of the metallic poisons, only in a diluted and moderated degree. Every prudent precaution is, therefore, necessary to prevent the possibility of such disagreeable occurrences.

LXXII. From these promiscuous and compendious observations, it appears that scrubbing, scouring, ablution, &c. are frequently adviseable, and even necessary on shipboard. And even these labours, without the conjunctive assistance of the multifarious considerations previously enumerated, would too often be found comparatively ineffectual. An almost innumerable host of circumstances must be implied, or duly comprehended, and made conjointly subservient to the performance or fulfilment of the general intention. As before remarked in the desultory observations on the atmosphere, the pureness of it is considered naturally and absolutely requisite to the maintenance and preservation of healthiness amongst mankind in any situation whatever, and certainly it is peculiarly agreeable to those subjected to the miseries of a sea-life. The enjoyment of pure air may be considered a necessary copartner in the constitution of cleanness, and of that of universally applicable prophylaxis. The different methods which have been proposed for the introduction of pure air, are generally understood under the appellation of *ventilation.* This will become especially necessary when the ports or scuttles are needfully obstructed, and it should always be practised when the orlop is the habitation of soldiery. In vessels of moderate size, and which are generally subjected to more motion than those of more extensive dimensions—in a similitude of circumstances—the air which they contain suffers more agitation, and is thus more quickly displaced. In the former periods of navigation, when less or little attention was paid to the comfort or welfare of mariners, ventilation, or the introduction of fresh air, was almost completely disregarded; and in small vessels, therefore, the only accession of air would be by their hatchways, and, in proportion to the quickness of their movements, &c. the change would be the more continual and effectual.

LXXIII. A knowledge of the general principles, the propriety or rather the absolute necessity of ventilation, must be obtained from an acquaintance with the circumstances and qualifications of the atmosphere, which have previously, but concisely and imperfectly, been investigated. Every officer or person going to sea in the capacity of superintendant or commander of any number of his fellow-creatures, should at least have some notion of the mechanical properties of the atmosphere, (which necessarily comprehends the common air, with all its heterogeneous impregnations ;) upon which they all depend, not only, immediately, for their temporal existence, but also for some of their comforts or miseries. And the impression of its harmful influence is frequently exemplified on shipboard ; in the production of annoyance of every conceiveable graduation, from the most superficial inconvenience to that of the most indomitable complaints, or even, in some instances, death instantaneous. Every day illustrates, amongst people of populous and crowded places, the remarkable difference betwixt those who are the tenants of dreary abodes, and who are obliged to respire the foul air of confined apartments, and those who are provided with all the necessaries of life, and also enjoy the wholesome assistance of a purer atmosphere. The inhabitants of the ship which is large, commodious, and sufficiently ventilated, are conveniently distinguished from those who are unluckily confined in a vessel oppositely circumstanced.—Ships may be ventilated two ways, and this indeed is the common manner in which it is accomplished, either transversely, with regard to their longitude, or from above downwards, or by the air entering at the hatchways; or these two modes of administration may act in combination. From what has already been advanced upon the operation of heat upon air, it must appear that it is susceptible of expansion and dilatation, and in proportion to this expanding influence, it acquires additional specifical lightness. The process of ventilation in ships, garrisons, barracks, &c. frequently depends upon the relative denseness of the air entering, to the thinness or rarefaction of that to be displaced. In a ship which has been shut up, all, perhaps, but the smallest crevices or apertures, the cool air may be felt entering by these holes, in small streams, while the rest of the air is warm and particularly unpleasant. Sometimes, in these circumstances, the rarefied and heated air ascends by the hatchways, so that, upon descending, a stream of heated foul air strikes the face,—and which, occasionally, produces a sensation of threatening suffocation. This is most distinctly perceptible when the transition is made from fresh cool air to the impure and heated of the confined apartment. The men, after such disagreeable confinement, and the effects of bad air, sometimes assume a sickly aspect, especially the weakly, or those of enfeebled constitutions, and some of the symptoms formerly enumerated, towards the conclusion of the sketches on the atmosphere, make their appearance.

LXXIV. It may be said, perhaps, that the subject of ventilation should have been examined when considering the atmosphere, but it was thought better to postpone it to the subdivision of the work, comprehending some considerations on cleanliness and accommodation. When ventilation becomes necessary, it presupposes the presence of uncleanness, and it does not invalidate the generally applicable conclusion, whether this may be perceptible or invisible, if it is understood to exist by manifesting consequences. The necessity of ventilation, perflation, or by what appellation soever the same shall be comprehended, implies something connected with, or included in, the air of the apartment to be ventilated, which renders it necessary that it should either be qualified by the admission of purer air, or wholly dislodged by the substitution of that which is comparatively uncontaminated. As essentially necessary not only to temporal existence but to common comfort, pure air in ships, in garrisons, &c. is, therefore, indispensable; and he who neglects the introduction of pure air into his ship, subtracts from the common welfare of his ship's company.

But the usefulness of the presence of fresh and pure air in ships, in prisons, in barracks, in garrisons, and indeed in every situation where breathing creatures may be placed, is too well understood to need any elaborate examination and commendation; and more especially after what has been said in the disquisitions of the introduction, and on the atmosphere. In the preservation of healthiness, it forms one of the most powerful and extensive means for its maintenance. Whole ships' crews have been much injured in their healths by inattention to the subject of ventilation. In these circumstances it should be constantly performed by some appropriate contrivance, and the manner and degree of ventilation are considerations of importance.—"When the whole ship's company sleep below at once, which is always the case in harbour, the respirable portion must be very quickly consumed. The scuttles, and sometimes a few ports, are opened for ventilation. But these have their inconveniences. The man who lies nearest the scuttle finds the current disagreeable, and often shuts it. In harbours locked by high lands, it is a good plan to keep the ship's broad-side to the wind, by a spring on the cable. Much, however, might be done by having air-flews, (flues,) so constructed as to communicate with the upper part of the ship, raised some feet above the gun-wale, with scuttles fitted to open, as the wind may be on the beam, or otherwise. The lower end of these ought to come within two feet of the lower deck; by which means the current of air would be diffused abroad, without blowing partially on any particular sleeping-place. A very equal circulation would, in this manner, be maintained, when there was (were) a necessity of laying turpawlins over the hatches to keep out rain, or when wind-sails could not be put down to advantage in bad weather. The Medusa hospital ship was fitted at Plymouth with air-shafts of this description; and, when duly attended, kept the hospital sufficiently ventilated. We can find no objection, as far as we have conversed with officers, to their general introduction throughout the navy: they can be so constructed as to be clear of the guns and ropes; and when we consider the great advantages of pure air to life and health, we ardently wish to see the trial."

LXXV. Different proposals for ventilating ships have been mentioned; but a few effectual modes for introducing fresh air, are better than manifold or complicated contrivances. The well-known wind-sail is most commonly employed; but, in calmness of the atmosphere, when ventilation, in many situations, is most requisite, it is altogether unserviceable. When applicable, however, it will be the most convenient and the least complicated, and will generally be sufficient when the breeze possesses strength for its suitable dilatation; for unless there be a certain degree of impetus the attempt at ventilation by the wind-sail, will be ineffectual or incomplete. And, here, it deserves notice, that although, frequently there be the appearance of ventilation, yet it is commonly very inadequate, and especially in the night-time when it is most necessary. In a strong breeze, the wind-sail is commonly forced so strongly against the edge of the hatchway as to form an angle with the deck; and is, sometimes, so compressed as almost to preclude the air having any admission. When a ship is sailing close on a wind, the upper deck will often be sufficiently ventilated without the aidance of wind-sails, but this does not apply to the lower decks when the ports are closed, or even to the orlop of a common Indiaman when carrying military. In these circumstances the fresh air must be conveyed to the deck which it is intended to ventilate. The circular pieces of timber, or hoops, with which wind-sails are sometimes constructed, are insufficient for supporting or maintaining their desireable distension; and on this account, there should be perpendicular slips of wood extending betwixt the circulars; and they might be fastened or retained in their proper situations by buttons or ligatures. A wind-sail, thus properly constructed, will generally, when suspended, retain nearly its cylindrical form, and thus be more convenient for the passage of the air to be introduced. They should be made of different capacities, agreeably to the dimensions, and other circumstances, of the apartment to be ventilated. The wind-sails are commonly allowed to hang in the middle of the hatchways; but they may be differently inclined, accordingly to the particular purposes. Their inferior opening should be at a moderate distance from the deck of which they are the ventilators. In ventilating a deck which has no lateral openings, ports, scuttles, &c. for instance, during the ingress of the cooler air the efflux of the impure and rarefied proceeds by the same apertures.

LXXVI. "Whenever weather will permit, wind-sails ought to be put down and carefully trimmed; sufficiently large to throw in a strong current, that may by its force perflate every corner: the intermediate space between the lower ends of each wind sail ought therefore to be kept perfectly clear, as they will reciprocally draw from each other, and thus render the stream every where pure.—In the well-regulated ship, where one of the main-top-mast stun-sails, from its commodious size, is usually converted into a wind-sail, the lower end is generally put so low as the hatch of the main-hold; and when the fore-hatch is kept open, that part of the hold is of course well refreshed. But the whole bottom of the ship cannot be purified in this manner, the spirit-room being surrounded by bulk-heads that are water-tight, for the security against fire. The bread-room ought to have a wind-sail to itself; and the forepart, which is commonly a close bulk-head, ought either to be grated or constructed with folding-doors, to be laid open as often as may be found necessary. I consider the bread-room of a ship, from its present pent-up condition, the number of lights so frequently burning in it, and the noxious effluvia issuing from cheese, &c. as a species of volcano that is constantly throwing out pestiferous fumes to shorten and weaken life." As already observed, different methods have been commended, and even employed, for ventilating ships, but the simpler and most conveniently manageable, and at the same time the most effectual, are undoubtedly preferable. Ships in the Navy sometimes have used machines, designedly contrived for the purpose of extracting the air which is considered as rendered impure, but in merchantmen, few, if any, of these have been introduced. Hollow metallic pipes, or tubes, have been mentioned, and even at one time were occasionally employed. It was intended that they should communicate with the fire-place, or pass through the galley-fire, and thus, by the expanding or rarefying influence of caloric upon a portion of the air in the tube, or tubes, it naturally acquires a disposition to move in that course in which it meets with least resistance, but the inclination will be almost invariably upwards. The consequent avolation of the expanded air will constantly be succeeded, or replaced, or rather substituted, by some which is more condensed, and which will likeways suffer a similar alteration; and thus the operation might be rendered continual, as long as the expanding influence were not interrupted. This is a method which, for obvious reasons, is neither convenient nor constantly practicable. This operation, in the night for example, and when most necessary, must be frustrated from the customary extinction of the prime mover of the proceeding.

LXXVII. Even although pumps, or other machinery, have been, and may be, contrived for abstracting what is vulgarly styled foul air, yet this is not adequate to the purpose; it is certainly necessary that pure air be introduced. "The instruments now in use for extracting foul airs, are as much adapted to the purpose as the intention required; but the air which rushes in, to restore the place of that just extracted, gives no additional purity, unless a fresh column is flowing in from the upper parts of the ship. This shows the great necessity of flews and wind-sails, that no portion be ever permitted to stagnate below, but a constant circulation throughout the whole preserved. —Amongst the various omissions which contribute to the injury of the health of the crews of His Majesty's ships, nothing seems more extraordinary than the general neglect there is of working the fixed ventilators. These should never stand still for a moment. A boy is capable of working them; and it may also be made a little extra-duty for such as may be guilty of very slight offences. To judge of the utility of them, one has no more to do, than to visit any of the enclosed parts of the ship, with which they have connexion, where they have not lately been used; set the ventilators a-going for a few hours, and visit the place again, and the difference of the state of the air will be found as obvious to the senses, as the distinction between extreme heat and extreme cold. The ventilator in the forepart of the ship should be particularly attended. The air in the store-rooms there situated, especially the gunner's, becomes so foul, as frequently to be scarcely respirable, and every thing in them decaying and rotten. The powder too is greatly injured by the humidity and foulness of the air, and causes the manufacturer to be blamed for its bad quality, where the diminution of its strength has arisen from the want of due attention to it in the magazine, where seldom any pains are taken to correct the air, and where sometimes the powder remains during a whole year, without the barrels containing it being changed in their position. The several materials of which powder is composed have, and more especially in damp situations, a natural tendency to separate from each other. Where, therefore, the barrels remain a long time in one position, the saltpetre descends towards the bottom, the due proportion of parts is destroyed, and the powder is good for nothing. I am, therefore, persuaded that the clamour against the powder, with which His Majesty's ships have been furnished, has not always been well-founded, and that the bad quality perceived in it has generally arisen from a want of due care in its preservation. I have seen a very great number of trials made of the strength of various sorts of powder, made in different nations, and the result of these trials was, an unequivocal decision, that the British powder was fully as good, if not in general the best made in Europe. It is clear, therefore, that the barrels containing powder should be turned, at least, every two or three months, and particularly when in so close and damp a place as the magazine of a ship of war.

LXXVIII. "The fore-masts of ships are found more generally decayed than either of the others; and this is undoubtedly occasioned by the foul and humid air, with which the commonly unsound part is almost always surrounded. Motives of safety will, perhaps, continue to prevent these evils from being perfectly removed; but they may certainly be much remedied. I have often thought, that the outward doors of the fore store-rooms, might have a scuttle in them, covered with copper punched full of holes, which would admit a considerable portion of fresh air, without the least danger of accident. And as the state of the weather, and other circumstances, may admit, the doors of the store-rooms should be thrown open for a considerable length of time during the day; and, to prevent accident, an officer should constantly stand before them until they are again shut. Such stores as may with safety be removed, should be occasionally got upon deck to be aired, which will greatly tend to their preservation, as well as give the more free admission of fresh air into the store-rooms, &c." These remarks of Dr. Trotter's have an especial reference to His Majesty's Navy, and some of its circumstances, as more particularly connected with the subject of ventilation. The subjecting all the different apartments of a ship to the influence of fresh and pure air, is certainly a consideration which cannot be too much commended. For it is not impossible for one portion, or part, of a ship to be sufficiently ventilated, while other parts of her are, by confinement, generating and diffusing mischievous exhalations. In this manner men may work or lodge safely and agreeably in one part of a ship; while, if they were placed in another, they might be considerably incommoded from the foulness of their atmosphere. The ventilation of a ship also in the daytime is far from being sufficient, however agreeable the air of a deck may be thought while the perflation is continued. But very soon after all the ports or scuttles (if the vessel is framed with such openings,) are closed in the evening, or at any time in rougher weather, &c. and especially if containing a considerable number of people, the air soon becomes heated and disagreeable. The continuation of the ventilation is, therefore, necessary; and, while the introduction of pure air is performed, some channels, or pipes, would be adviseable for the efflux of that which may be deteriorated. These tubes, for conveying the air outwards, should open not far from the upper part of the deck; and the cooler and denser air should be carried nearer to the lower part of the deck to which it is communicated.

LXXIX. Ventilation has been and may be accomplished by bellows of sufficient magnitude; but the management of such a contrivance would require continual mechanical impulse, which can hardly be supposed would be incessantly applied by manual labour, without the interposition of some other modification of instrumentality. The bellows might be occasionally employed in ships which are strongly manned, but they could be more powerfully and effectually moved by the assistance of some suitable mechanical power, and some kind of construction actuated on the principles of the steam-engine might be found applicable. A machine capable of both pumping out the foul air and introducing fresh, pure, and cool air, might be made, and yet not be inconvenient from its magnitude. The combination of these two actions would constitute the most beneficial mode of ventilation, and particularly at those times when it would be most requisite, either when the atmosphere were in a state of stillness, or when the parts, &c. of a ship may be closed in particular circumstances; or it may very commonly be applicable in those vessels which may have been originally constructed without such apertures. In this manner not only the decks but the hold might be ventilated, and in this part of the ship its occasional performance might be sufficient. While the foul and lighter air were abstracted from the upper part of the space betwixt any two decks, the cooler and fresher air might be introduced at the bottom. The fresh air might be conveyed either along varnished leathern, or metallic, or wooden pipes, having small holes in their upper sides, by which the air might issue into the superior regions of the apartment. This modification of ventilation would seem to be occasionally suitable to sleeping-places, in which the aerial conduits might be carried along the sides of the beams, and being perforated in the manner just mentioned, the air would thus be immediately diffused where it might be of most importance. The quantity and velocity of the air conveyed could be regulated by a valve in the main tube, the swiftness of the revolutions of the machinery, and the coolness and freshness of the air introduced, and the proportion of the people in the apartment.

LXXX. It is not simply the introduction of air that will suffice, and especially in the warmer climates, it may occasionally be necessary, or at least agreeable and refreshing, to keep the air in a continual state of undulation. This would be very commendable upon the orlop deck of an Indiaman when occupied by recruits or soldiers; but this is, commonly, altogether disregarded, so that they are allowed, or rather compelled, to swelter in all the uneasiness of high temperature. In this situation the thermometer would perhaps stand at 90°, or even a higher graduation; when under coverture on the gun-deck, or the upper-deck, if defended from insolation, 84° might be the maximum. The general doctrine to be proposed applies virtually to all inhabited situations, when they are not properly ventilated by a naturally occurring commotion of the atmosphere, garrisons, barracks, prisons, low cellars, places of popular assemblages, in all these the occasional, or continual agitation of the air will be eminently adviseable, and a proper and judicious attention to a sufficient perflation of these places, and especially when they are occupied, should never be neglected. In calmness of the atmosphere, the air contained in these places must remain till it becomes rarefied and defiled. When it becomes considerably expanded, it begins to be displaced by air which is perhaps cooler, or which is certainly denser, and in this manner some alteration is introduced; but this is both slow and inadequate. If the air in these places were kept in agitation by any suitable machine, it would be more speedily displaced, and in augmentations of temperature would be particularly acceptable by the coolness which would be superinduced. When heated air is mechanically introduced, and by means of the common wind-sail, or any other contrivance, its influence is not so distinctly perceived as when it is cooler, and, consequently, the artificial agitation of the air, after its introduction, will be found both acceptable and advantageous. The moderated commotion of the air would promote a more quick evaporation from the surface, and thus aid in relieving irksome sensation, by an agreeable coolness being substituted. In all large places of assemblage, in extensive and crowded barracks, hospitals, workhouses, &c. the different apartments might be ventilated by means of a moderate machine connected with the building; and the mechanical contrivance might operate either by simply introducing fresh air, or, simultaneously, by both abstracting and introducing. If intended only to throw in new air, the different compartments would require to be constructed with tubes, communicating with the upper part, for carrying away the air which may have been contaminated.

LXXXI. In all the warmer climates the natives commonly use some means of putting the air in motion; and thus, even in a sameness of temperature, they much relieve their feelings of uneasiness. In India, and other countries, the adventitious Europeans are glad to obtain the assistance of a native to cool them with a flabellum; for it may be observed, that except the air be thrown into motion, the term ventilation is never legitimately applicable. The radicle is the Latin word ventus, which "denotes agitations of the air, that may be either moderate or as violent as possible;" it maybe defined to be "aer agitatus." "Semper aer spiritu aliquo movetur: frequentius tamen 'auras' quam ventos habet." "Ventus enim fit, ubi est agitando percitus aer." Ventilation seems to comprehend, or, perhaps, rather to be expressive of two different conceptions: it signifies blowing or fanning, and it denotes the act of exposing to the air, and especially when this latter is in a state of commotion. The term, therefore, can never be righteously applied while the air is motionless, or at least not sensibly agitated.—Even apartments constructed with windows, or other apertures, are often ventilated artificially by moveable machinery, by which an agreeable moderate breeze is produced; and this frequently enables the luxurious to swallow their dinner, &c. more commodiously and satisfactorily. The occasional commotion of the air in the orlop deck would also be gratifying and salutary to its miserable inhabitants: and the same applies to every part of a ship which may require a similar operation; the most suitable plan for answering this purpose is the desideratum. Many schemes might be proposed, but the mode must in some measure be determined by the accompanying circumstances. The confined air might be commoved, and ultimately displaced, by a structure calculated to operate upon the principles of the common winnowing machine; or the Indian mode of ventilation might be adopted. The first of these might be constructed with oblong pieces of painted canvas, extended upon wood or iron, and so connected with an axis as to form four panels diverging at right angles. The other might be made of a long piece of painted canvas, fixed upon a frame, which could be appended to a beam by means of hooks, and by causing the loose side to describe part of a circle, the air would thus be put in motion, and the effect might be modified by the rapidity of the movements, and the extent of the instrument. But these contrivances will in general be found inconvenient, sometimes inapplicable and lumbersome.

LXXXII. In the course of navigation, ships are occasionally detained for some time in particular latitudes; near the equator for instance, and betwixt the northern and southern boundaries of the trade-winds, where they are exposed to much rain and weather of irregular character. They are, likeways, liable to be exposed to a similitude of circumstances on the coasts of some continents, or in straits, or narrow channels, those of Malacca for example, and several others which could be mentioned. If it is in a situation obnoxious to the sudden assault of squalls, it is occasionally considered to be necessary to have the ports in a state of closure; or if small vessels are occupied they are not furnished with any openings; and when it rains heavily it also becomes requisite to cover the hatchways, and this is performed with tarpawlings, which are sometimes so closely defensive as neither to admit air nor moisture. A ship thus shut up is little better than a vessel hermetically sealed; and if this condition is prolonged, the air between decks sometimes becomes particularly disagreeable. This inconvenience might in some degree be lessened, by having the coverings of the hatches raised to some distance above the actual openings, which might be accomplished by erecting stanchions, or pillars, at the corners of the hatchways. This unduly confined condition of a ship, in the warmer climates, or indeed in any climate, is a cause of great annoyance, and especially if the people are numerously accumulated. This evil has been experienced even in an Indiaman of extensive magnitude, where, from a whimsical and unmerciful contrivance of the commander, (pro navis forma,) all the ports, and even the scuttles, were preposterously kept in a state of obstruction. In such circumstances, and when a vessel is crowded, the condition of the people sometimes becomes singularly unpleasant, and frequently highly distressing. And when the proportion of people is extensive, compared to the space which is their allowance, and if the unfavourable circumstances be of some continuance, accumulative inconveniences may be the consequences. And some of the annoyances superinduced, are the augmentation of the temperature, which, in the warmer climates, is sometimes particularly disagreeable, and progressive contamination of the air in confinement. Some of the circumstances accompanying this state of things have undergone a compendious investigation in the first department of this undertaking.

LXXXIII. In particular situations, Dr. Lind has recommended a ship, or hulk, moored at some distance from the shore, so that the persons occupying the floating machine might be separated from the injurious impression of all nosopoietic exhalations. And he observes that, "in Europe, all nations have hospitals; and many of them have found it absolute-necessary to erect hospitals, or infirmaries, for the sick, in their settlements and factories abroad. The difficulty is, to find a convenient and healthy spot: the manner of obviating this we point out, by proposing to have the hospital upon the water. Thus, a ship, or hulk, moored at the mouth of the river Senegal, and properly fitted for the reception of the sick in that garrison and factory, would, in a great measure, put an end to the dreadful mortality amongst our troops and settlers in that part of the world: transferring the sick and their hospital from the land to the water, is more particularly recommended to that settlement, as it becomes an object not only to the merchants but to government, on account of the soldiers stationed there, to whom it would be attended with many advantages.—In the first place, on board a ship, with proper care, a greater degree of neatness and cleanliness may be procured for the sick, by means of funnels pointing to the sea, and wash-cocks to cleanse them occasionally, than in most infirmaries on land.—A more free circulation of air can be obtained in a ship than on shore. I have, in a former publication, pointed out the methods of rendering the air in a ship at all times wholesome, by means of purifying fumes and fires: I may now add, that when ventilation, or a change of air, becomes necessary, it may be more effectually accomplished in a ship, by opening some port-holes, than in most chambers on land. A ventilator may likewise be provided for effectually keeping dry the timber and the lower apartments in the ship: this may be worked by a wind-mill fly; or the ventilator itself may consist in a wind-sail. It is necessary to observe, that all these ventilators should be made use of only during dry weather. For the preservation of the ship, the bottom should be sheathed with copper. From the rains the ship may be defended by a timber shade, or spar deck, projecting a little over her sides; which will also afford an effectual protection from the violent heat of the sun, during the intervals of the showers, and occasion an agreeable ventilation when there is any the least wind." Lind's proposal may be applicable and beneficial in various places where Europeans may be stationed abroad; and he remarks, "it would be proper, during the sickly season, on the coast of Guinea, and all other places in the East and West Indies, where the English factories are near the sea, to have another ship, besides that appropriated for the residence of the gentlemen of the factory, fixed at a proper distance from the land, to receive the sick immediately upon being taken ill. It would be a certain means of saving many lives."

LXXXIV. Ventilation is of essential benefit in the holds of ships, especially in the sultry climates, when the men are engaged in clearing and stowing them; and this would seem to apply emphatically to merchantmen. When the people are thus laboriously occupied, and perhaps much heated, or perspiring largely, little attention, commonly, is bestowed upon their comfort, or any attempt made to mitigate their sufferings. The conceited and ignorant officer who struts the deck, perhaps defended from the sun's rays by an awning, and fanned by the cooling land-breeze, forgets the irksome condition of his fellow-creatures below; he also probably forgets that he formerly went through a similar process with some of the younger officers who must now submit to the different stadia of their servitude, and act with the common men as directors and overseers. From inattention, however, to these circumstances, the people who are thus exposed, frequently suffer mischievously. And this may happen in various ways. From their severe labours, and profuse sweating, thirst becomes one of their most vexatious feelings; and they are often obliged to drink plentifully of any cool liquid to lessen the urgency of this disturbing sensation; and if the fluid drunk should be much below the heat of their own bodies, different painful symptoms may be produced, as already explained, when treating on the atmosphere. They may likeways suffer when they suddenly emerge from the hold, bathed in sweat, and naturally expose themselves to a cool air, if such can be found. In this manner the cutaneous exhalation may be suddenly suppressed; and this may occasionally be followed by various ills, agreeably to the state of the constitution. They may also suffer by washing themselves in cool water, which they are obliged to do to remove the filth collected on their surfaces.—The air in the hold may be heated to perhaps 90° or 100° of Fahrenheit; and this, with stillness of the air, and hard labour, becomes peculiarly unpleasant, and especially when the ship's hold is small, or nearly occupied. The holds of ships, therefore, in these circumstances, should be constantly and thoroughly ventilated.

LXXXV. Before quitting the subject of ventilation, it may not be improper to mention, that all the commendations on cleanliness, accommodation, the admission of fresh air, &c. are equally applicable to encampments, wherein the preservation of the healthiness of the soldiers is of indispensable importance. In tents which are crowded, the air may become as impure as in houses, or on shipboard, and be productive of as disagreeable consequences. In the original construction of soldiers' tents, the possibility of ventilation should never be overlooked; and they should be so framed as to admit of changing the air as frequently or as constantly as may be deemed necessary. In the warmer climates, and especially in stillness of the atmosphere, the air, in confined tents, with only one aperture for entering, becomes uncomfortably heated, so that the situation is rendered not only inconvenient, but sometimes nearly insupportable. The tents are sometimes extended closely to the ground, so that, in complete calmness of the air, the necessary change of this vital fluid must be altogether insufficient. The prevention of this evil will, in some measure, be secured, by having one or two suitable openings in the upper parts of the tent; which, as is well known, is commonly made of a conical figure, with the base undermost. The openings may be formed with flaps, which could be raised to any desireable line of inclination, and thus, during rain, its entrance might be obviated, while the exit of the foul and hot air would be accomplished. In some situations where it might be desireable to exclude vermin, or reptiles, and especially in the night season, the openings, near the bottoms of tents, for the admission of clear air, as well as those nearer the upper parts, for its avolation, might be fitted with cratitious textures of painted or varnished wire-work. The first tents, or tabernacles, mentioned, were those employed by the Israelites in their journeyings in the wilderness. Although the mention of soldiers' tents may appear to have little connexion with a work of this description, yet, upon reasonable consideration, it will be found a subject of weighty moment; and it would be well that all officers, interested in, or concerned with, the lodging and accommodation of soldiers, took the subject into their consideration. The subject applies intimately to themselves; and all those proceeding to the warmer regions of the earth, and who may be obliged to lodge in confined tents, will soon find that it is not a consideration of indifference. In encampments in the scorching climates, also, the exclusion of the powerful solar influence should as far as possible be always regarded, for the difference of temperature thus produced in tents may be very considerable.

LXXXVI. As this is not a subject of speculation, but of unconditional importance, and testified by experienced authority, the following observations from Dr. Dewar's Medical Sketches may not be inapplicable as satisfactory confirmation. In reference to the subject under contemplation, he says, "There was one circumstance, of general operation, which greatly injured the health of the army, and was peculiarly oppressive during the summer solstice, when we were in the environs of Cairo, a more sultry part of Egypt than any we had yet visited: I mean the kind of tents in which the men were accommodated. A soldier's tent, consisting of a single covering, was in that country a very inadequate defence from the rays of the sun. Those rays were still powerful within it; and it was seldom possible, for want of trees, to obtain a more complete shade in the heat of the day. The tents were at the same time so constructed, that, excepting at the entrance, they could not be opened for ventilation otherwise than by raising the part that touched the ground, which admitted an insufferable quantity of sand and dust. Consequently, the people within them were deprived of that little refreshment which the noon breezes produced. If we consider, besides, that the number of twelve, fifteen and sometimes twenty, were crowded in a tent no more than twelve feet in diameter, and tapering to a point from the bottom, it will appear that, in a country like Egypt, a soldier must find the nature of his accommodation one of his greatest hardships. In his tent, which is close as an oven, the extreme heat and impure air threaten suffocation, and rapidly bring on debility. In such a country, it would be a very great improvement, to provide an army with double tents, like those of the Mamalukes, which, being likewise so constructed as to admit of commodious ventilation, are comfortable and healthy. The additional trouble of carriage would be a mere trifle, compared with the general comfort that would be produced, the numbers of lives that would be preserved, and the saving that would be made in hospital expenses. Had this been done in Egypt, I believe there would have been but little sickness of any kind."—In conclusion upon the subject of ventilation, let this be an unalterable regulation;—*whatsoever contrivances are in employment for the purposes of ventilation, where otherways closeness or confinement of the atmosphere might be prejudicial or destructive, it should be perpetually and completely extensive and sufficient.*

LXXXVII. Fumigations have been proposed, and also at former periods of navigation frequently employed; and even in times when the minds of men should have been more illuminated, and in possession of a more considerable proportion of reasonable information. But in commending and using such unavailing, and frequently detrimental and destructive applications, they must be considered to have been most ungraciously obnubilated. The combustion of a multiplicity of substances was customarily recommended, even before the knowledge of chemical operations could possibly conspire to explicate or illustrate these processes of fumigation, or how they might introduce the mysterious consequences. An enumeration of the substances which have been employed in fumigations would be very unnecessary; and more particularly as every superannuated boatswain, &c. from His Majesty's Navy can tell that pitch, tar, rosin, oakum, tobacco, brimstone, and different aromatous substances, &c. were principal ingredients in these Tartarean contrivances. The sulphur, when in a state of ignition or inflammation, is a powerful but dangerous substance; it was, however, frequently employed among the idolatrous of different nations for purposes of ceremonious purification. By these people, it was invariably considered to be a remarkable mundatory substance. The Greeks, in cleansing or purifying a person, performed the operation by proceeding three times round him, and as frequently sprinkling him with a bough of laurel, or a torch of some fragrant wood, previously lighted at the altar, and then dipped in the holy water, which they consecrated with a mixture of salt and sulphur; for as the solar fire, or a dæmon in the sun's orb, was their chief acting Divinity, so they thought fire was of sovereign efficacy to purify and make them holy, &c. Juvenal says —" Cuperent lustrari siqua darentur sulphura cum tædis, et si feret humida laurus."—Lucian mentions the purifying of a place by three times going round it, *θεῳ και δᾳδι*, with sulphur and a torch, &c. and repeating some religiously ceremonious incantations. Sulphur, therefore, was commonly denominated *θειον*, the divine thing. Whatever reverence the ancients might have for fumigations, these, as they are performed in ships, deserve reprobation. The ingenuity of mankind could hardly have devised a more effectual method of consuming the most beneficial part of the air, the oxygenous principle, and loading the remainder, now constituted principally of thanatode, and a variable lot of carbonate of oxygene, with pernicious exhalations.

> " Non fumum ex fulgore, sed ex fumo dare lucem."

It may be remarked, that *fumus* is the root of the smoky word fumigation, which conveys the very notion of thickness, uncleanness, and suffocation.

> " ———glomeratque sub antro
> Fumiferam noctem, commixtis igne tenebris."

The fumigations which have been so strenuously but imprudently and erroneously recommended, should now be absolutely and irreversibly interdicted, or rather abolished, that is, so completely disannulled, that even the odour thereof may not be perceptible. The supposition of the necessity of fumigations, also anticipates and comprehends a blameable inattention to, or misunderstanding of, accompanying circumstances.

LXXXVIII. As this is a matter, not of a jocular, but serious and weighty nature, and implying considerations of indispensable importance to the public service, it may be worthy of some notices, and references to the articles which have been trusted, when in these days the illuminated practitioner would be led to discredit their usefulness. One long accustomed to the matters and diseases of sailors, expresses himself in some places as follows: " I applied to have the ship smoked with vinegar and gunpowder, which was done; and I requested that she might not be washed below during the winter." This last proposal might be adviseable, if the vessel were kept sufficiently dry and clean; the decks might be scrubbed with heated sand and quicklime; but still the beams, sides of the ship, and under surface of the upper decks, would be in a state of uncleanness. In another place he states; " I applied and had the ship well smoked twice, a. m. with vinegar and gunpowder, and p. m. with junk and tobacco fires, and with hot loggerheads quenched in tar. The ship was covered every where with a white powder. After smoking with tobacco, the smell was very strong for some time." And on the day following this fumose operation, he adds; " The air was very agreeable last night to the men who lay in the tiers. Upon every inspiration, after smoking with gunpowder, I tasted the sulphur.—Fires were lighted in the hatchways." These would operate, by rarefying the air in their neighbourhood, and thus causing a current of air to fly upwards at the hatchways, might help to remove the air which had been in confinement.—" Our ship was thoroughly cleaned, washed with hot vinegar, and afterwards smoked with gunpowder, junk and tobacco, as before. Fires were lighted in the hatchways, and some *sp. salis* evaporated between decks." This occurred in 1777, and makes an approach to those kinds of fumigations which have been recommended and employed, since chemical influence has been better understood, and more manageable. "The starboard bay, where the prisoners were confined, though it has been well cleaned, and smoked with gunpowder, still retains a very disagreeable smell." The same author, in another place, remarks; "Every possible method ought to be incessantly used, to render it" (the air) "as pure and salutary as the situation and circumstances of the sick will admit.—Various are the means which have been made use of for this purpose, and recommended by authors—of whom the late Dr. Lind, of Haslar Hospital, has been more particular than most writers on the subject. Since the publication of the former edition of this work, Dr. Carmichael Smyth's mode of fumigation has prevailed; and been thought useful by many. But on boardship, the most effectual general method of fumigation, that I know, is, beyond comparison, with tobacco." And in another place; "But a good sick tent erected on shore, would have been of much more benefit, not only to the sick, but to the ship's company in general; as we might then with more ease have probably *smoked* out the infection entirely from on board." This, then, is the language of a man, who served about thirty-one years in a marine and maritime medical capacity, and whose confidence in the power of smoking seems to have been as steadfast and invincible, as his credulity in the Peruvian Bark, as a panacea in Febrile Diseases. "Behold, all ye that kindle a fire, that compass yourselves about with sparks: walk in the light of your fire, and in the sparks that ye have kindled."

LXXXIX. From an incorrect conception thus subsisting, and implying that fumigation, accomplished with the forementioned and different other substances, is both commendable and advantageous, attention to the beneficial and requisite management has been wholly misunderstood, or rather judged to be of no considerable importance. The necessary attention to cleanliness has thus occasionally, or too frequently, rather, become a consideration of indifference. Insufficient ventilation and cleanliness, confinement, &c. which are always unjustifiable and prejudicial, are some of these consequential improprieties. It must be deemed supremely objectionable, therefore, that fumigations should constitute any part of the means in employment for the preservation or imaginative maintenance of cleanliness. The very supposition of the propriety or necessity of these fumiferous performances, implies some inconsistency, some mismanagement, or some reprehensible uncleanliness. The preservation of cleanness, therefore, and, above all, the admittance of as pure air as can possibly be obtained, are considerations constitutionally indispensable to the conservation of healthiness. And, with respect to air, it may again be repeated;—"A faithful and unremitted attention to the requisite admission of undefiled air to every part of a ship, is a consideration of the highest importance for preserving the health of those employed for marine service. There is no contrivance comparable to this,—none of equivalent importance. It is inimitably beneficial in maintaining health, comfort, strength, and animation. And it is also the most efficacious prophylactic, and even a very powerful application, in the removal of mischievous distempers already subsisting or prevailing, &c." And, even notwithstanding the most commendable administration of the other circumstances appertaining to this department of the subject, it is again most particularly recommended, that ventilation be extensively and perpetually in performance. For, amongst preventative contrivances, this must necessarily and undoubtedly be considered one of the most energetically acting circumstances. The operation of fumigation, with some very peculiar exceptions and limitations, should, as a preventative contrivance, *now*, in these days of knowledge and improvement, be for ever exploded : it was engendered in ignorance, and practically maintained by perverse imitation and stubborn formality. If fumigation should ever be considered adviseable in situations where infectious distempers may either be prevailing or may lately have predominated, the plan proposed and practised by Guyton Morveau seems the preferable.

XC. The foregoing is a very abbreviated statement of a full conviction of the general inutility of fumigations, drawn from an extensive consideration of the evidence on the subject, immediate observation, and reflection on many of the accompanying circumstances, unprejudiced by the influence of any declarative authorities. But, in reference to the subject of fumigation, the following observations, deducible from opportunities of collatitious information, and affirmatively authenticated, may not be unnecessary. "The spirit of fumigation had arrived at its full height, on the introduction of the Nitrous Vapour, published by a Court physician, countenanced by the Admiralty, and directed by the *Codex Officialis* of the Sick and Hurt Board. But not one of its supporters have yet ventured, or deigned, to go one step into the inquiry concerning the nature of Contagion, or its chemical attraction for this vapour. The naval department, they were led to believe, would eagerly embrace the practice, on the authorities which accompanied it; but, fortunately for the service of the country, it came at a time when the subject of health was beginning a new æra; and when both officers and surgeons doubted the validity of what came in so questionable a shape.—The world has now seen a second edition of Dr. Smyth's Work; in which he has published some reports of naval surgeons to the Commissioners of Sick and Hurt, on the *supposed* efficacy of this anti-pestilential Fume. I do not mean, at this stage of the discussion, to criticise those *select Reports;* but I feel most unfeignedly for the reputation of the medical officers, when I behold official documents laid before the public eye in defence of the grossest delusion. Yet these are all the Board have produced from seven hundred surgeons, after seven years' war! There is one thing for which I can give the reporters due credit;—attention to cleanliness is a part of their operations. But, at the same time, I cannot help remarking the passive spirit of these gentlemen, with fuming pipkins in their hands, that they never asked themselves, what is the chemical nature of this Contagion? does it possess form or substance? how does this vapour act in destroying it? these questions arose so naturally from the employment of fumigation, that it shows as much a want of common curiosity, as it was unphilosophic, not to interest themselves in the business. A disease disappearing, during the time any article of the Materia Medica is used, may receive the credit of the cure from an ignorant by-stander, or a shallow observer; but the man who notes the history of cases, the mind inquiring after truth, must weigh causes and effects, draw conclusions from reasonable premises, and appeal to principles confirmed by experiment and matter of fact only. To say, that the nitrous vapour subdues contagion, without explaining the manner, is like the fly on the chariot-wheel in the fable. It reminds me of a story told to children, that the Great Mogul orders a bell to be rung when he goes to dinner, and conceits that the whole world dines at the same time. In like manner, these gentlemen trim their pipkins, and conceit, while the fumes ascend, that whatever is contagious within their reach is annihilated and destroyed.

> ——" It was great pity, so it was,
> This villanous saltpetre should be digg'd
> Out of the bowels of the harmless earth,
> Which many a good tall fellow had destroy'd
> So cowardly."——— SHAKSPEARE.

XCI. "Acron, a physician of Agrigentum, was the first who thought of '*lighting fires, and purifying the air by perfumes*,' to put a stop to the pestilence that ravaged Athens, anno ante Christum 473, so that this species of superstition is of pretty ancient date. Some time ago, I had an intention of writing the history of Fumigation, from Acron's Perfumery down to the nitrous vapour of 1796; but I met with so many ludicrous stories of necromancy, exorcism, sorcery, and witchcraft, that the subject began to lose all the gravity of a scientific inquiry.—The advocates for the use of *unrespirable gases* must blush, when they see the business of purification thus taken out of their hands; and their practice, when adhered to, made an engine of torture to a ship's company. With such examples before their eyes, we trust officers will disclaim the surrender of their fine discipline for the *monstrous quackery* of any fumigating process." In a note it is subjoined; "In this instance, it is but fair to conclude, that the infection was prolonged, by the diffusion of *poisonous airs*, from fumigation, in a season and climate otherwise so favourable for subduing it.—There can be but one opinion, that pure air is fittest for animal life: therefore, the correction and expulsion of a tainted atmosphere, in ships, have always employed a sensible officer. Fires are occasionally put into the holds and wells, to dislodge carbonic acid gas; or, in plain English, fixed air. Another foul air our officers are in the habit of expelling, is *azote*, or *mephitic air*: this is performed by opening ports and scuttles, unlaying gratings, and putting down wind-sails. The fixed air of the well is produced by the decomposition of water and vegetable matter, as the timbers of the ship. The azote is of animal origin, and abounds, whenever the air is polluted, by breathing animals, as between the decks of a ship. It derives its name from being fatal to animated nature. Now, this azote is the base of nitrous acid: they only differ in the degrees of combination with oxygene, or what was formerly called dephlogisticated air: and, in proportion to the quantity it attracts of this principle, it is called Azote, Azotic Gas, Nitrous Gas, Nitrous Acid, Nitric Acid. In short, Dr. Smyth's Preventive is the very substance that every intelligent officer is hourly employed to drive from the decks of His Majesty's ships." It would be tedious and unmeaning to trace all that this author has advanced and collected from others upon this subject, which he dignifies with such terms as these; "charm, nostrum, quackery," &c. &c.; such are the complimental appellations.

XCII. "Soon after the nitrous gas had received the sanction of the Commissioners of Sick and Wounded to be employed in the navy, some suspected cases appeared in a ship at Spithead, not attached to the channel fleet. The surgeon informed his captain of his suspicions, and his wish to comply with his new instructions in diffusing the nitrous gas, which, he added, had obtained the first character as a prophylactic. The captain had just been reading on the subject: "Pray, Mr. ———," he said, "what do you take contagion to be?" He quoted Dr. Smyth's authority in giving an answer; but the inquisitive officer was not satisfied. "How does nitrous gas act on contagion?" Dr. Smyth's book was again resorted to; it was not satisfactory. They turned to Mr. Kier's letter, which the doctor adduces in support of the salubrity of his gas. This only rendered the business more obscure. It was like Mr. Shandy and Uncle Toby's dialogue on parturition. "Dr. Smyth and the chemist seem at variance," said the captain; "he speaks of a vitious fermentation; this is a phrase I do not understand." —"Nor I," said the surgeon; "but to explain in their way, I apprehend there is a necessity for terms that chemistry does not at present employ." They walked along the decks; they were clean and dry; the people clean and well clothed: a main-top-mast stun-sail nicely balanced and trimmed, as I have seen it in the Royal Sovereign, and other well-regulated ships, with wind-sails at the fore and after-hatchway, had made the air as pure as above. They both agreed that no nitrous vapour could be wanting there. They visited the sick-birth: "this, indeed, is offensive," said the commander, "and you had better try your fumigation." The surgeon ordered the sand to be heated, and the fumes ascended from the pipkins. About an hour, and the air had no smell. In a short time the offensive flavour returned; the fumigation was renewed, and it again disappeared; but the sick rather complained of coughing, and one of them vomited. In an hour the effluvia became as disagreeable as at first: some foul utensils were now discovered in a corner; they seemed to taint the air, and were ordered away to be cleaned. The offensive vapour never more returned. "Now," said the discerning officer and surgeon, "this description answers exactly to the account given of the Union hospital-ship; but, instead of calling in the assistance of nitrous gas from a London physician to destroy this foul air, it will be a more healthy practice to prevent its production, which we can do *gratis*, by the pure winds of heaven."—"Thus," added the captain, "I can see how institutions of this sort may do harm; this gas, as it overcomes nastiness of smell, may happen, in indolent hands, to supersede the use of soap and water, and we shall be overwhelmed with filth." Reference may be made to Dr. Trotter's volumes for many animadversions and reprehensions on the subject of Fumigation.

XCIII. With some occasional exceptions, fumigations should be viewed as secondary considerations. In large or capacious ships, under suitable discipline, susceptible of proportionate ventilation, and uninterrupted maintenance of the commendable cleanliness, they should, perhaps, be deemed continually unnecessary. An elaborate investigation of the subject would here be rather inconsistent; and it was considered of more interest to examine some of those circumstances which are too commonly slighted, or overlooked, but which, if properly managed, the necessity of fumigation might be prevented, than to explain and commend processes which may become adviseable from carelessness. The plan proposed and practised by Morveau is probably the most efficacious. It is founded on the muriatic acid as its basis; which, although singly a weaker acid than either the nitric or sulphuric, yet it seems to have a stronger affinity for animal substances, and is, therefore, generally preferable for fumigation. When it is combined with an additional proportion of oxygene, as has for some time been supposed, but which condition of the acid is more lately thought to be produced by the abstraction of a small portion of hydrogene from the common muriatic acid, (and thus constituting the strong acid commonly styled oxymuriatic, oxygenated, &c. muriatic acid,) it acts powerfully in decomposing the compound airs, (vulgarly called gases, a most barbarous appellation,) and also all animal matters; and thus, probably, acting upon all the productions of animal or animate operation, of which the matter of contagion is one not of the least importance. And thus, although the nature or essence of *contagion* be altogether unknown, nevertheless, the strong acid is known to destroy all putrid smells, &c. and may have the power of decomposing or destroying contagion; and this it may accomplish, whether contagion may be considered as a simple and singular substance, and possessing peculiar properties, or whether it may be contemplated as in company with some animal matter, or matter of animal formation, as its fomentum, or pabulum, and vehiculum; either of these notions is a consideration of indifference, if the *morbific matter* is so changed as to be made ineffectual. But this part of the subject is hitherto veiled in obscurity and difficultly penetrable concealment. The operation of fumigation, therefore, will chiefly apply to small places which are so confined as not at all times to be conveniently susceptible of ventilation. The operation of the oxymuriatic acid (or, agreeably to the present notions on the subject, chlorine, or the muriatic air and oxygene in combination,) is powerful, diffusive and penetrating, and may, therefore, be occasionally employed, in situations where the morbific influence has been unluckily generated, for its extermination. Although this, as elsewhere remarked, is little better than fighting with a shadow, yet it is well to know, that it is possible by one mode of agency (which is itself far from being perfectly understood,) to overcome another, which, in its nature and operation, is, in the present condition of human knowledge, absolutely incomprehensible.

XCIV. These foregoing observations seem to include the most important documents necessary to be attended to for the preservation of the unspeakable and inestimable enjoyment of healthiness on shipboard. They are the Outlines of Marine Hygieia, and comprising most of the general principles of fundamental importance to this composition, and, therefore, all originally in contemplation. The modification, adjustment and specifical application, of which, in their practical and efficient properties, must be determinable and proportionable, accordingly to an almost indefinitely, and often unexpectedly, multitudinous host of circumstances, presenting either concurrently or successively. The different methods proposed, and certainly with a friendly intention, may be improved, enlarged, and variously administered, agreeably to the alterable conditions of climates, weather, the state of the vessels in which they are practically exemplified, &c. the nature of the exposure and employment, and innumerable other considerations.—As in different situations, diversified proportions, of necessity, may naturally introduce themselves, and, consequently, demanding a regulated and proportionate management, conformably to the discernment of commanders and others, so the subject, generally, is especially interesting to the professional administrator. They should all be properly prepared for discharging honourably and beneficially the engagements of their respective occupation and profession. The enlightened and considerate commander will not be satisfied with an indiscriminate administration; he must condescend to an investigation and ascertainment of the nature of accompanying circumstances. He will even condescend to give an easy ear, as illustrated and commended in the Introduction, to any favourable suggestions for the assistance of those for whom he should, in some degree, be considered responsible. The moving powers must be cherished and supported, otherways the revolutions of the machinery must be equally impaired. The preservation of cleanness, with all its comfortable consequences, is, therefore, one of these indispensable considerations.

XCV. The surgeon, it is presumed, will be so far animated with an honourable inclination and even predilection to professional excellence, as to determine and maintain an invariable propriety of behaviour, and indefatigable attention to the acquisition of knowledge, and also a judicious and masterly performance of the duties of his department, a minimis ad maxima, in all its particulars. By a conjunctive efficiency and skilfully regulated management, the commendable cleanliness, both as applicable to the crew and ship, will become familiar and delightful in possession, and effectually beneficial in its consequences. Several other methods of ventilation might have been mentioned or contrived; but those specified will answer if properly conducted. If thought needful or useful to increase their number, or variegate their properties and application, &c. the mechanical philosopher will always be able for inventing, constructing, and supplying a sufficient multiplicity of these contrivances. As common conditions and situations prevail, the forementioned instructions, exhortations, and commendations may generally be considered to be adequate; but where it is judged adviseable, some chemical processes may, peradventure, be advantageous. But, as formerly mentioned, this proposal presupposes the concomitance or antecedence of some imperfection or impropriety, and more especially of some communicable, or what are customarily denominated contagious diseases. And even the employment of fumigation in such circumstances implies an incongruity; it is as ridiculous and unprofitable as the skiamachia, or fighting with a shadow, which possesses no palpable essence, it is a dimicatio adversario non repugnante; the diffusion of corrosive vapours, (as of the nitrous acid air in its different modifications, or of the oxygenated muriatic air, &c.) or poisonous acid exhalations may occasionally be fortuitously, but never explicably, beneficial. The mention of contagious complaints would seem to lead into some discussions on the dispositions and distinctive characters of such distempers; but all that can be proposed in this place, is to state the propriety, and commend the expediency, of accurate attention to the prevention of embarking people harbouring the miasmata of what are indistinctly and confusedly called infectious or contagious diseases. This is certainly a subject of the greatest importance and consequence, and if not carefully attended to, or mismanaged, may be the cause of extensive mischief and calamity. When this may be considered so momentous and interesting in every situation of life on shore; at sea it should more especially receive the most enlightened and determinate consideration; but more shall be said on this subject in the consequential animadversions.

XCVI. This department of prophylactic administration, the exclusion or subduction of infectious diseases, may very reasonably be considered as constituting a most remarkable part in the description, and undoubtedly more particularly in the application of cleanliness. For, it may with justice be observed that through inattention to this subject, and the others which have been the ground-work of the preceding discussions, complaints have frequently been engendered, and of these, febrile diseases and scurvy have been the most frequent and important. The prevention of the generation of many of these, and the exclusion of others, might frequently be practicable; and this possibility should be the cause of congratulation and encouragement.—As formerly suggested, no complaints engendered on shipboard, and, through continuance, mismanagement, &c. acquiring the property of infecting by contagion, if skilfully treated, can ever be universally disseminated, or prove particularly troublesome. Complaints may occasionally commence, and be threatening in their disposition to propagation, but, if vigorously and knowingly counteracted at their first appearance, will, all other circumstances not particularly unfavourable, be easily manageable. The practitioner must be in a state of preparative professional knowledge, adequately calculated to every conceiveable occurrence: but so much hath already been said on this subject, that enlargement appears here unnecessary. The concurrence, or countenance, and the approbation of a commander, or officer in function, are always approveable. Many benevolent and enlightened practitioners have been grievously disappointed from want of the acquiescence of their commanders. Proposals, however beneficial in their consequences, if not thus strengthened by constituted authority, must frequently be ineffectual. These observations relate to the generally applicable management: in considerations strictly professional, the administration should be confided to the practitioner.

XCVII. The progressive improvement, so acceptably contemplated in the means employed for the preservation of the healthiness of seamen, has, within these few years, and more especially in the British Navy, been remarkably conspicuous. This amendment refers, generally speaking, to the accommodation, the victualling, the clothing, the exposure, the exercise, and cleanliness of sailors. When their present condition is compared to what subsisted even towards the conclusion of last century, an important difference will be immediately perceptible. The commendable condescension to investigate the inconveniences, the innumerable annoyances and imperfections, with which the poor sailor is perpetually encompassed, must afford inexpressible gratification to those generous and illustrious commanders, who have seen the demonstration of the beneficial consequences of their disinterested benevolence. Every officer who has thus been prompted by his humanity, and inspirited by his benignity, to the performance of kindness so powerfully serviceable, may, with propriety and gratulating complacency, express himself in the language of Horace, when he consoled himself with the anticipation of the perpetuity of his lyrical compositions.—

> "Exegi monumentum aere perennius,
> Regalique situ pyramidum altius;
> Quod non imber edax, non Aquilo impotens
> Possit diruere, aut innumerabilis
> Annorum series, et fuga temporum."

The physicians and surgeons employed under their command have committed the grateful memorial of such friendship to impartial and faithful recordation. What commander of a merchantman has bereaved himself of the provisions calculated for his own consumption, and administered them to the assistance of the necessitous of his own ship's company? The gallant British Naval commander hath frequently performed this kindness. He has employed the ship's hard fare that the indisposed and enfeebled defenders of his country might be preserved and obtain a healthful restoration. "It deserves to be recorded, to the immortal honour of the officers of this Fleet," alluding to the fleet engaged on the 29th and 30th of May, and on the 1st of June, 1794, "that the stock of their messes, consisting of sheep and poultry, with all the delicacies which their tables afforded, was cheerfully resigned for the support and comfort of the wounded. But their goodness did not stop here; they learned that the diet of the hospital was deficient in some articles which a wounded sailor could wish for, and sums of money were sent to procure them." This quotation may serve as a general example, but the instances of individual contributions are almost innumerable. As the commercial and defensive interests of the country are in intimate connexion, the one the way of nutrimental communication, and the other the conservative maintenance of the constitutional and instrumental organization; so, their lastingness and prosperousness must be ever inseparable from the congratulatory remembrance of every subject dedicated to inimitable Britannia, and to a Gracious and Paternal Sovereign.

CHAPTER SIXTH.

CONSEQUENTIAL ANIMADVERSIONS.

"Quæ certè meliùs persuadebit aliis, qui prius persuaserit sibi."

"Nam, dum omnia quærimus, aliquandò ad verum, ubi minimè expectavimus, pervenimus."

"Nam ut medicis non apparentia modò vitia curanda sunt, sed etiam invenienda, quæ latent, sæpè ipsis ea, qui sanandi sunt, occulentibus."

"Et ut vetus gubernator, litora et portus, et quæ tempestatum signa, quid secundis flatibus, quid adversis, ratis poscat, docebit: non humanitatis solum communi ductus officio, sed amore quodam operis."

I. ACKNOWLEDGED and indisputeable must be the importance of the circumstances constituting the substruction of the forementioned disquisitions; but unhappily, all the endeavours at satisfactory elucidation irresistibly participate of considerable imperfection. Considerations of usefulness have led into an amplitude of investigation, which, at the commencement, was not anticipated. The interesting nature of the subjects comprehended, and the extensiveness of the application of the multifarious animadversions, have undoubtedly contributed to this unexpected enlargement. The lawfulness of the following remark, seems in most cases incontrovertible; that complication or entanglement is demonstrative of imperfection, embarrassment, or the incompleteness of any undertaking or of any mechanical contrivance: and contrariwise, the simplicity of any design, the convenience of its management, and the durableness and steadiness of its action, or serviceableness, are equally indicative of its approximation to accurateness. Contemplation at its commencement is commonly and indiscriminately applicable; but continuately, or subsequently, it assumes an obsequiousness to more distinguishing investigation. The converse of the antecedent proposition is apparently and occasionally remarkable; to this determination the experience of most discriminating individuals will bear probable testimony. Another consideration constantly alive to the apprehension of the philosopher, is, the remembrance of this circumstance, that the human mind can contemplate, intelligibly and distinctly, only one object at the same moment, with the anticipation of satisfactory discrimination and ascertainment.

II. The mind, ever active and expansive, abhors the notion of confinement, and rests not upon indetermined generality, but institutes, until perfect discovery be obtained, the supporting intermedium of probability, which is frequently unsteady and deceitful; but by perseverance, after sojourning through a wilderness of cloudiness and perplexity, the truth is conclusively attainable. Having, therefore, reviewed objects both collectively, or aggregately, and singularly, or disjointly, it condescends to the comparison of individuals and the advantages of the consequences. The acquisition of this instructive and regulating knowledge, enables the possessor, at every opportunity, to call in the assistance of circumstances and implemental power, for the subversion of difficulties, otherways, insurmountable, or the accomplishment of an intention, which, without this administration, would be impracticable. In the removal of a violent and rapid disease, for example, the adhibition of one remedy will frequently be ineffectual; whereas, by conjunctive medicinal efficiency, judiciously superintended in its application, the end in view might have been expeditely obtainable. The inhalation and exhalation of air, will be found insufficient for permanently supporting animation; the air must be in possession of properties specifically answerable for the purposes to which it is appropriated. If destitute of the commendable qualifications, instead of being the instrument and administrator of life, it may be the messenger and cause of death instantaneous. Fearlessness in the navigator, without the knowledge and expertness communicated by observation and experience, instead of being advantageous, would only be contributing to the speediness of disappointment, or the aggravation of misadventure. The preservation of healthiness, as hath been repeatedly said, is not constituted in the most faithful observation and management of any one circumstance: it is generally the offspring and recompence of circumspection, and the discriminate counteracting of every contingency, which might, otherways, prove prejudicial.

III. The determinate application of the preceding disquisitions, will be concisely illustrated by these last fundamental, but rather recondite notifications and considerations. The investigation and discussion of the four principal subjects were conducted, by a naturally legitimate progression, from those circumstances which to man are of the highest importance, to things which are comparatively less considerable. As the nature of those circumstances, with all their vicissitudes, and their particular management, seem considerations of the greatest moment, both in the natural history of man, and also in the conservation of his healthiness, and consequently of his terrestrial happiness; so, the forementioned mode of arrangement, in an undertaking of this description, was adjudged to be the most commendable. And if this conclusion is generally operative, which seems a veritable proposition, the truth of this determination is still more strikingly and peculiarly suited to the unfortunate seafaring. All objects in nature may be either singularly or aggregately contemplated; but for the purposes of philosophic and satisfactory investigation, a disjunctive examination, for ascertaining the peculiarities of individuals, seems indispensable. A comparative introspection is, furthermore, for the sake of practical conclusions and derivative advantages, frequently commendable. The enlargement, however, of the several points of disquisition, notwithstanding their remarkable importance, would have swollen the work to a magnitude inconsistent with the size prescribed to the undertaking, which has already far surpassed commencing expectation.

IV. The simplification or multiplication, and appropriation of the propositions and instructions herein contained, must be determinable by the judgment of the superintendant, or by the concomitance of multitudinous circumstances. Combination and disjunction, are terms implying an opposition either naturally subsisting, instituted for the purpose of physical inquiry, or designedly employed for the fulfilling of some consideration of usefulness. The plainness, cheapness, and practicability of any proposition, are apparently commendable qualifications, and more particularly when applicable to mediocrity of understanding, or the performance of services which seldom claim or receive the interference of the intelligent or philanthropic. Complication, it may be understood, is referable to the condition of a natural subject, which is unavoidable, and by human power irremoveable: or to the state of a new invention or piece of mechanism, not hitherto rendered complete, but still partaking of that rudeness which ordinarily accompanies imperfection: and lastly, it is applicable to an assemblage of things or means calculated for the execution of some undertaking, or for the completion of any mechanical contrivance, or even as applicable to the preservation of healthiness, or the extermination of indisposition. In the conclusive acceptation of the term, it is peculiarly adapted to all contrivances propounded for the accomplishment of the views comprehended in this undertaking.

v. The composition, variableness, heterogeneous impregnations, lowness or highness of the temperature of the atmosphere, with almost innumerable other considerations, are constantly pressing upon mankind in all their situations in life, and constitute to them circumstances of unavoidable and remarkable importance. The air forms a support absolutely and essentially requisite, even to their momentary existence, whereas against a transitory abstraction of the three other subdivisions of the general subject, they may make a short struggle. The philosopher will perceive, that the order of succession has been proportionate to their respective importance and usefulness. Notwithstanding this true statement, they must in their management and application, or the endurance of their influences, be likeways considered in a state of combination. Even the distinctive observance of part of the preceding instructions, variously embodied in the course of the work, will not be sufficient; there must be a careful and discreet regard to all the circumstances in the order and force of their concurrence, or as they may be naturally and necessarily anticipated. The judicious will always be watchful, and his conduct the result of consideration, and governed by the principles inculcated by prudential experience.

VI. In conjunction with other necessary and influencing considerations, the nature and exhibition of the dietetical supplies will, it is sincerely expected, never be carelessly and culpably overlooked. From the goodness or indifference of the properties of these, the persons using them may be materially affected in the state of their constitution; and hence the numberless ills originating from unskilfulness or mismanagement, and the protracted employment of articles impaired in their qualities, or which have departed evidently and injuriously from the integrity of their requisite properties. These circumstances are particularly interesting when the principal and commendable undertaking is to maintain, as long as possible, that share of health, the unimpaired enjoyment of which is so justly deemed an invaluable advantage. This was formerly pronounced to be the second indispensable or essentially necessary consideration in the preservation, and continuation, and maintenance of human-kind. This is a part of the subject which, in the former periods of navigation, laboured under considerable disadvantages; its management and application were in a state of reprehensible imperfection. An acceptable and beneficial reflection seems to be, the confirmation of considerable improvement in the mode of victualling, with the expectation of its prosperous and encouraging consequences.

VII. The use of habiliments, modifiable, indeed, by the custom of different countries, by the physical peculiarities imprinted upon particular spots of the terrestrial superfice, the changeable qualifications of the atmosphere, and the properties of seasons in continual revolution, &c. was a third subject, which underwent some examination. This part of the undertaking may avowedly be regarded as the third momentous, or even indispensable, circumstance in the natural history of man, and also in the defensive attempts instituted more generally for his ordinary comfort and the concealment of indecencies, or for his preservation from the destructive consequences of diminished temperature. With some trifling exceptions, amongst sailors this subject has been left too much to their own capricious or whimsical and injudicious inclinations. The suggestions formerly offered and particularly recommended to the attention of all those interested in the welfare and protection of seamen, will probably be productive of more correctness in the application and management of a matter of such great importance. The preceding observations, which relate more directly to this subject, will explain its nature and interest; and the adaptation of the doctrines and instructions must frequently be almost exclusively regulated by the discernment (often small enough) of those who may be in more immediate attendance; and hence the urgent necessity of their being in possession of suitable information, and, consequently, of qualification for the determination and fulfilment of their duty in all its circumstances within the comprehension of their superintendency. An acquaintance with all those occurrences which may render changes of raiment commendable, whether these may refer to their qualities or quantities, &c. will be found requisite and serviceable to all those who are guardians of health. The management of clothing being *nearly* of equivalent importance with the preceding subjects, it must always constitute a material point in the preparations for the preservation of healthiness.

VIII. The fourth grand and general subject in the conservative administration was said to be cleanliness; by which may be understood, every act necessary or conducive to the maintenance of cleanness.—Although multitudes of the human race willfully and obstinately wallow in nastiness unrestrained, yet this is no exclusive argument against the practice of cleansing, for sooner or later they must suffer from their carelessness or uncleanness. Amongst sailors and soldiers, cleanness, generally speaking, is only kept by the law of enforcement; few of them, comparatively, are spontaneously inclinable to cleanliness. After this practice of maintaining cleanness hath been for some time observed and established, it becomes familiar, and its execution is then generally rendered acceptable and a matter of consentaneous performance. On board of ships, this wholesome practice is peculiarly necessary and advantageous; and the neglect of which is so commonly accompanied with immediate annoyance, and not unfrequently succeeded by disagreeable consequences. From these abbreviated reflections, the conclusion will be drawn, that the four antecedent subdivisions of the prophylactic management are principal considerations in the organization of a plan for the saving or keeping of seamen unimpaired, as far as practicable by the discriminate adjustment of natural means to the preservation of constitutional healthiness. It appears, also, that the whole subject will admit both of a simple inspection and examination in the aggregate. The different particulars must frequently be investigated, to acquire a knowledge of those which may chiefly be prejudicial; and without which particular inquisition, the offending cause might operate injuriously, and continue in the state of concealment. On the contrary, sometimes the contemplation of the associated efficiency of circumstances, for the discovery of the foundation of the mischief, may be indispensable. The nature and tendency of the introductory disquisitions may now be more fully comprehended: notwithstanding the foregoing transient remarks, the discerning and experienced, however, may conclude, that some other matters of a diversified description may, likeways, be deemed of importance, and which hitherto have not received any consideration: the history of some of these is difficultly reduced under any precise head, or point, of a comprehensible classification. Some of these will hereafter be shortly considered —for, the lengthened and particular examination of them is in some measure unnecessary, and is now, from the size of the volume, here incompatible.

IX. The honourable inclination and ardent desire for success will naturally suggest the expediency of skilfully combining and judiciously apportioning all the forementioned illustrations, investigations and animadversions, to the production and support of one general effect; namely, the preservation of healthiness. The performance of one piece of service will not be sufficient; there must be a discriminating contemplation of every circumstance; and where one or more of these are found offensive and detrimental, the attention of the guardian must be more pointedly directed to the cause of inconvenience, and when practicable, amendment must be speedily introduced. A fair outside will not suffice; there should be a particular examination of all the circumstances which can, either directly or remotely, affect the general condition of comfort and health. A disregard of any of the antecedent suggestions, and many others with which the ingenious and intelligent are supposed to be previously acquainted, will ordinarily be accompanied with inconvenience, or succeeded by troublesome consequences. The developement of many of these circumstances, and the determination of their respective force and influence, will, however, sometimes demand more knowledge and discrimination than are commonly observeable amongst those entrusted with such undertakings: but experience instructeth even fools; and, therefore, those who are naturally even rude, and almost untaught, may, in a moderate time, acquire a competency of information for their guidance on ordinary occasions.—Observation must have repeatedly ascertained, that, in proportion to the attention conferred upon all the accompanying circumstances, health, with all its comforts and blessings, hath been in some proportion correspondent. And the remark may be presented, that, in those ships where complaints and other calamities of multifarious complexions have harmfully predominated, if examination had been instituted, they would frequently have been found owing to some blameable oversight, or reprehensible heedlessness and mismanagement. And, finally, on this point, this consideration should never be overlooked, for it naturally and obviously implies both much force and truth; that oftentimes the misfortunes, otherways contemplated as unavoidable, happening to the seafaring, are the regular offspring of the aforementioned circumstances.

x. The foregoing observations upon the four prinicipal points of investigation, as influencing the preservation of healthiness or the production of distempers amongst mariners, &c. being brought forward, some additional and more particular remarks may now be presented upon some circumstances which could not so conveniently have been previously introduced. In these remarks, which are partly deducible from the preceding annotations, seem to be implied, the propriety and necessity of a suitable and faithful attention to the whole, in combination or aggregation, or as they may be singularly or disjointly operative or applicable. The maintenance of healthiness and the prevention of disease being the fundamental considerations, as applied to the seafaring especially, these must confessedly be singularly important and interesting to all those concerned with marine services and navigation, viewed in all its contingencies, uncertainties, incommoding circumstances and disappointments. The question of moment and interest is still further heightened from considerations such as the subsequent. The unavoidable inconveniences accompanying a sea-life are sufficiently numerous and troublesome without the permitted existence of any evil which is not absolutely irremoveable. The appointment of means for the preservation of constitutional healthiness and soundness, of all those employed for public and useful purposes, seems to be dictated and enforced by the irresistible principles of humanity: the opposition or disregard of which presupposes that unkindness or want of commiseration—which seems only a trifling degree removed from irreclaimable savageness, and the most unwarrantable unmercifulness. The disadvantageous consequences of unhealthiness in ships, and which inconveniences may indeed very commonly be attributed to some inexcuseable mismanagement, seem to be conclusively demonstrative, and at same time should constitute admonitory considerations. And, lastly, to come to what may, in one point of view, be styled mechanical arguments, and which can also be conveniently apprehended, are the considerations of commerce and defence, whose unimpaired maintenance seem so essentially requisite to all nations depending upon navigation.

XI. As it would be tedious, and in some measure superfluous, to enter minutely into the examination of every conceiveable circumstance which might affect the state of health and disease, so the following suggestions will relate chiefly to points of real importance, or such as have hitherto not been properly elucidated, or which have been misapplied, or which have not been completely understood. A consideration of the circumstances with which sailors are more immediately and perpetually encompassed must be undertaken singularly; and, by a comparison of the consequences upon respective individuals, the nature and amount of influences, when in the state of associated or combined action, will be more sufficiently comprehended, and their true force appreciated. This conclusion, however, is not so constant and uniform as to be invariably applicable; for, the effects and sensible properties of the compound may be widely different from what might be expected from the components when separately contemplated. Without this experimental knowledge, it may be observed, which is so frequently serviceable, and at all times commendable, every attempt, however sincerely intended for the general interest, must be retarded, disturbed, or, what is very probable, rendered unavailing.—While the seamen are kindly furnished with the pure vital fluid, their diet will also receive the suitable attention; their clothing and their cleanness, and the adaptation of their circumstances or accommodation, will be objects equally deserving attention. It is not the accompanying disagreeableness of being shut up in a close place with the chance of the accumulation and confinement of foul air which is here deprecated, although even these circumstances become peculiarly displeasing. The frequent repetition or continued influence of them will, or may, be slowly but surely productive of mischievous consequences. The effects will first be observed upon persons of particular constitutions, and the debilitated. Proneness to complaint, and the production of almost numberless anomalous phænomena, which may differently incapacitate the sufferers, and occasionally puzzle the thoughtless or inobservant practitioner, will be the supervenient disadvantages.

XII. The description having commenced with the atmosphere, one of the most indispensably requisite circumstances for supporting the life of mankind, it was likeways observed, that it may accidentally constitute the vehicle of destructive inquination. When this possibility is considered, and all the injurious operations and prejudicial consequences apprehended; these alone, with the reasonable and intelligent, will constitute sufficient evidence and testimony of its importance. Another reflection, moreover, highly interesting to mankind in general, and particularly to the seafaring, is, that the obtainment of actual good is commonly indicative of the synchronous exclusion of positive mischief. And what will be acceptable considerations to the niggardly, are, the comparative cheapness and conveniency of the application of the prescription; and to which may be added, the wide range of its serviceableness. In company with the blessing of good air, the administration of a wholesome diet, suitable raiment, cleanness, kindness, approveable correctness in disciplinary management, and many other things which need not here be enumerated, will be especially beneficial. At the beginning of a voyage, when a ship's crew is in possession of a healthy condition, in combination with the forementioned advantages, and not harbouring the rudiments of any infectious disease, it is, in the most probable state for preserving this desireable healthful condition unimpaired. All these things skilfully superintended in their collective influence, there seems, in the present improved state of navigation, to be no admissible excuse for the existence of general or diffused complaint. No distempers of an alarming nature will ever be troublesome, if every circumstance in the conservative administration has been liberally provided of suitable properties, and their use continued by a discriminate application.

XIII. For the commendable accomplishment of such desireable purposes, commanders, and all officially interested or responsible, should possess a tolerable share of judgment and general knowledge. All the instruments or means of prevention must be carefully and skilfully managed and applied; and a modification of distribution and application must, likeways, take place, agreeably to the nature of places and seasons, and, also, to the circumstances of individuals respectively. The injudicious or indiscriminate attempts at adopting and employing the different suggestions and absolutely necessary amendments already proposed, will not be sufficient. Discernment in all circumstances seems commendable; and the methods of procedure must be determinate and appropriate. In the heterogeneous assemblage constituting a large ship's company, many inexplicable discrepancies of constitution and dispositions will be remarkable; and frequently an adaptation of discipline and prophylactic administration, in some measure proportionate to these circumstances of individuals, may not be altogether unnecessary. From these short notices, it may be understood, that not only a physical but moral discipline will be commendable. The due management of the *animated* machinery employed in the Public Services implies greater difficulty than what is commonly supposed. But so much has already been introduced in the Preliminary Observations upon these and collateral subjects, that here a lengthened discussion of them would rather be improper. It may, however, be remarked, that, as these considerations are of such extensive and invincible importance, the observance of them, and management thereunto conformable, will ever be found of remarkable usefulness; which, with the patriotic and humane, constitute unceasing arguments for the perpetual and indefeasible obligation to performance.

XIV. The observations and instructions have commonly been assumed on general principles; or, it should be understood, that these are intended as the fundamentals of the different disquisitions. From these, amongst the discerning and intelligent, a knowledge of particulars is for the most part conveniently obtainable. The generality of the principles, the easiness of their comprehension, yet the extent and force of their operation, the importance of their employment and usefulness, the expediteness and comparative cheapness of their appropriation, the inexcuseable nature of negligence, should all be adjudged to their commendation. The correctness of the discrimination of the advantageous from the unfavourable circumstances affecting the state of constitutional healthiness of mariners, will, moreover, be a consideration of the highest importance. Mischief, as already observed, may thus originate, from the operation of one circumstance more particularly, or from a conjunction of concomitants or occurrences, but whose precise number, or collective efficiency, does not admit of ascertainment. The person, therefore, who possesses a moderate knowledge of human nature, and of the influence of those occasions to which it is more commonly subjected, will have a fortunate and beneficial superiority over those who have less illumination of understanding. The early discrimination of the unpropitious circumstances, or at the moment they become operatively perceptible, will lay an acceptable foundation for counteracting them at the commencement; and thus, perhaps, for speedily establishing the reign of health by this opportune detection and immediate removal of the causes of indisposition. The philosophical investigator will also understand, that some causes affecting the general health operate upon more confined, others upon more extended principles. The influence of some, for instance, may be topically conspicuous, while the operation of others may be more diffusedly remarkable. And it is not undeserving of remark, that such morbific powers may operate in conjunction.

XV. The exhausting influence of undue heat hath been long experienced, and its consequences have been subjects of lamentation; and the untimely or unseasonable destruction thereby introduced has also been remarkable from time immemorial. In all tropical climates, and even in many countries situated outwardly to these territories, the devastating influence of caloric is one of the most prejudicial circumstances. How often is this unpleasant occurrence exemplified to confirmation in the British natives who have emigrated to such unkindly climes! Many of these, however, are not simple or unmixed examples of the mischief which is such a detestable attendant upon these unpropitious peregrinations: the misfortunes and irreparable consequences of these relegations are very commonly aggravated by the imprudence and irregularity of the adventurers themselves. These, unhappily, are such common failings, or rather fostered offences, that a very extensive proportion of those emigrants thus resolutely and obstinately, and determinately and artificially, hasten their own destruction. When circumstances of this description are knowingly and wilfully encouraged, the fate of the sufferers is less lamentable, and should constitute a lesson of instruction and admonition to the survivors. As this is a subject involving the cause of humanity, it naturally appears of the deepest interest, and especially in the Public Services, in which the avoidance of mortality and needless expense is a consideration of demonstrable importance. Various hints have been interspersed in the course of these animadversions, and in the Introduction particularly, in relation to some of these circumstances.

XVI. These observations and conclusions are applicable more decidedly to those, who, perhaps, are for a time under no immediate controlling agency but the dictates of their own disorderly consciences; or rather of their own wayward and headlong inclinations. Soldiers and sailors, when on shore, will, almost constantly, when not under the strict eye of regulating governance, be influenced by these worthless dispositions, as far as their means and opportunities will reach; and, when thus for a time removed from the dominion and compass of discipline, there is no class of men more under the sway of folly and vice, and the indulgence of their whimsical propensities. The first order of those specified, however, have more in their power to be exposed to evils of the forementioned denomination. The sailors, when on board of ship, where there may be a prudential and vigilant discipline, are in possession of less opportunity of becoming irregular or dissolute. And, when at sea, more especially, no irregularity, or even an approach thereunto, should ever be permitted. A sailor, then, although obnoxious to almost innumerable annoyances, privations and hardships, is, however, by virtue of manifold instructions and regulations, which may be constantly operative in his ordinary situation, restrainable from many excesses and consequent misfortunes to which he would otherways be in exposition. The immediate observance and practicable check under which the sailor, while actively employed, is ordinarily placed, although at the time he may consider it as a disagreeable circumscription, are, notwithstanding, to him circumstances of unaccountable usefulness.

XVII. The advantages of the conjunctive management of all the previously enumerated circumstances will be still further illustrated, when it is considered, that the employment of any two of the foregoing principal divisions of the subject will commonly prove ineffectual. Even the supplying of pure air to the places of seamen's abode, and also the furnishing of tolerably good victuals, will not be so beneficial if they are incommoded by the destitution or insufficiency of clothing, or even its inconvenient adaptation; and when they are allowed to wallow in irreclaimed dirtiness, the conservation of their health becomes much more problematical. And the debased condition, or the imperfection, of the two former, even with the possession of suitable clothing and cleanness, will, in like manner, impair or lessen the probability of saving health, or lead to disappointment. From these hints, therefore, it will be understood, that this subject may be reviewed either in a combined or simple condition. A particular knowledge must be gained from an investigation of circumstances individually, and an acquaintance, various and comprehensive, derived from a collective act of contemplation. Although general notions are the primary in subjects which have not previously been properly or fully examined, yet, in strictness of investigation, particular inquisition, or an inquiry into component particulars, must supervene. This generality of knowledge, however, will not be sufficient. This supposition of a competency of information, which commonly possesses the presumptuous, or those who will not labour to acquire suitable notions of particular subjects, is too frequently remarkable. The conceited and impertinent smatterer is easily discoverable; and such should always be brought to his natural point of declination. A particular knowledge, as lately stated, will be requisite for the management of this department; every circumstance must be separately or singularly weighed, and then a beautiful contrivance for general service will be the consequence, modifiable in its construction, or arrangement of parts, and application, agreeably to the urgency or mildness of particular occurrences, or as they pass into a state of combination.

XVIII. And further on this head, suppose a ship's company supplied with victuals of the most approved properties, but, at same time, furnished with water of indifferent qualities, a question will arise, whether there is a possibility of preserving their healths so long as if they had been assisted with every circumstance of an advantageous qualification. The answer is not difficult; the chances are much against them; and what is more, the speedy generation of particular complaints is thus much strengthened, and their premature production most undoubtedly accelerated. Another proposition is allowable in the way of illustration. Although the men should be tolerably well supplied with every thing adviseable or requisite to their comfortable subsistence, yet, if they are constrained to sleep in a place where bad air is unduly or largely collected, or which is often virtually the same, where ventilation is disregarded, or is not properly performed, the maintenance of their healthfulness and usefulness will thus be less or more influenced, proportionally to the continuance, extensiveness, &c. of the evil, and the particularities, susceptibilities, &c. of respective constitutions. This is a matter of the highest moment, and the author's attention is here painfully summoned, from the remembrance of a miscreant, who, unhappily, had it in his power to dishonour the appellation of commander, and who, in opposition to an express and earnest request of the medical officer, founded on principles of humanity and propriety, deprived a ship's company of the needful admission of fresh and pure air, by shutting port-holes, scuttles, the latter being calked; and, when it happened to rain, the hatchways were also in a state of complete obstruction!!! This monstrous and inhuman treatment occurred in a ship of ample dimensions, and where there was no necessity for such unreasonable and unjustifiable management.

XIX. Diminutions and abstractions occasionally take place in seamen's allowances, and these are made from considerations of sparingness. These abridgements and retrenchments, of any thing judged to be serviceable or even consolatory to a poor and unhappy sailor, are cruel, the savings contemptible, and the consequences occasionally particularly disadvantageous. A distinctive view of particulars will thus assist in the adjustment and regulation of the whole undertaking. None should embark with the important charge of managing a ship's company but those who are suitably prepared with all the pre-requisite and commendable qualifications. They should know their ships and also the men; and, moreover, they ought to have some foreknowledge of the voyagings and destinations to which they may be appointed. This prescience of some of the principal circumstances to which they are to be successively exposed, will be confessedly necessary, when it is considered, that many of the preparations should be determinable by the peculiarities which may probably be concomitants in their undertakings. This proposition can be readily illustrated. An important difference takes place betwixt a voyage to the northern ocean, and one to the West or East Indies, or even a voyage to the Mediterranean. The voyage or passage to any of these places will, likeways, be somewhat different, in conformity to the season of the year at the time of departure. They must also understand, as formerly explained, that, in a voyage to the oriental territories, a very considerable disproportion and variableness of temperature must be undergone. Those who are virtually interested, should further know a consideration of particular importance to all who may be embarked, that some provisions or victuals are susceptible of much longer preservation in some climates and seasons than in others; and this will also be circumscribed by their state at the time when they were obtained. In the warmer climates or seasons of most countries, several articles speedily pass into putrescence and destructive decomposition; whereas, in the temperate regions they might have been capable of considerable preservation.

xx. The variableness and inconstancy of every circumstance should continually be kept in remembrance, as these have an intimate relation to the welfare of mankind in every situation, in every climate, in every country, and, especially, to that of the seafaring. This consideration being of an extensive description, requires a knowledge proceeding from a generally applicable to a more particular investigation, and consequential scientifical management. A commendable arrangement and proportionate application of all the prophylactic means, presupposes a knowledge or intelligence of these circumstances, and the humane and enlightened will always be prepared for a discriminating superintendency. When it is found that some unexpected or inexplicable evils arise, inquisition must commence for detecting the mischiefs; and the judgment of the guardian of health must be exercised for opposition or removal. This seems to be another reason affirmative of the usefulness of an acquaintance which is knowingly and happily diversified; "nam imprudens harum rerum, ignarusque omnium," must always be implicated in difficulty, and his charge often threatened with danger; "navem agere ignarus navis timet." A satisfactory conclusion it seems to be, that in proportion to the discrimination of all the accompanying circumstances and their management, so will be the advantages superinduced.

XXI. The abundance and goodness of necessaries, or of every thing requisite for the defence and protection of health, are a collective consideration of no contemptible importance. Although several of such things can be obtained only by attention, yet, neglect, or the assertion of their being probably expensive, should never be allowed to extenuate or exculpate the designedly inattentive. A fortunate and encouraging reflection to those who are humanely inclined, and animated with patriotic disposition, is, that a pleasing diversity of the most beneficial preservatives, is natively and copiously produced; but even these, by the thoughtless, injudicious, or unmerciful, are sometimes maliciously and unwarrantably interrupted in the accomplishment of their unpurchased serviceableness. Such, for example, is the wilful seclusion of pure air from the place allotted for sleeping, &c. by occluding the principal apertures convenient for its admission. This unfriendly and mischievous exclusion of a substance so peculiarly beneficial, or rather essentially requisite to their comfort and health, is a blameable impropriety, and the cause of much uneasiness to those who may unhappily be in exposition to its baneful influence. This imminution or deprivation, and consequent deterioration of this vital fluid, are sure circumstances for undermining healthiness; and are thus, too frequently, the unsuspected and undiscovered causes of multiform distempers. The most arrant noodle, the most unkind and inhuman, must understand, without any particular explanations and inculcations, that, when he thus excludes his ship's company from the suitable regulated and sufficient influences of ventilation, he may be said to withdraw from them one of their best comforts, or rather one of their greatest temporal blessings; and designedly and criminally to pave the way to the ingeneration of a multitude of distresses, molestations, and indispositions of multifarious complexion. If such men could view the business impartially and intelligibly, they would come to understand, that they, in a certain degree, militate against their own safety and the prosperity of their constituents.

> ——"Tu, dum tua navis in alto est
> Hoc age, ne mutata retrorsum te ferat aura."

XXII. The consideration, that the same principles by which health is so acceptably maintained are also concurrently and essentially the most effectual preventatives of complaints, and sometimes the most profitable in subjugating different diseases, should ever be favourable to performance. The convenience and cheapness of the prophylactic applications; their universal propriety and necessity to mankind, and especially to those who are unpleasantly and too often prejudicially accumulated; as exemplified in crowded towns, cities, garrisons, &c. and on shipboard; indubitably and pertinently recommend their inviolable observance. They who are guilty of subduction and imminution of any of these naturally constituted and appointed privileges, or employ any subterfuges to escape or elude the faithful and skilful adoption of any of these measures, which are so evidently and eminently requisite to the maintenance of the health of those occupied in the commercial and defensive interests of their country, should be responsible for the consequences of their carelessness or mismanagement. The cunningness and debasement of those hackneyed in mercantile employment, render their kindness and friendship at best distrustful, and the likelihood of their disinterested management too liable to suspicion to gain any confidence. "A merchant shall hardly keep himself from doing any wrong; and an huckster shall not be freed from sin. As a nail sticketh fast between the joinings of the stones; so doth sin stick close between buying and selling." The dispositions of those again, who stand in defence of their Sovereign and Country, it is reasonable to presume, are in possession of an honourable inclination to the fulfilment of their duties and the acquisition of advantage. They are more than temporizers, or the implements, perhaps, of one voyage; (in which those, who are embarrassed in the problematical issue of speculation, are principally interested in their own successful performances;) their prospects are lengthened, their welfare, their honour, and the interests of their country, are constantly with them, arguments paramount to all other ordinarily intervening occurrences. From a conviction that much depends upon their martial skill and vigour, and their absolute animated effective strength; the saving of health, is, with them, a consideration of inestimable importance. Thus it appears, that in the governance or management of all these matters, the judicious and discerning must have both a singular and collective view of the objects constituting the groundwork of their preservative administration.

XXIII. In order to be convinced of the propriety and advantage of an early regard to all the phænomena indicative of the departure or deviation from the customary healthful standard, or aliis verbis, the incipient condition or existence of disease; and of distinguishing and comprehending every thing relating to the nice discrimen subsisting betwixt a healthy condition and disease beginning; a very particular knowledge of mankind, of individually characterized constitutions, of the symptoms of particular complaints, or of these in combination, &c. is essentially requisite. The prevention of distempers, however, demands an intelligent information, an enlightened understanding, a minuteness of comprehension and an accurateness of nosological distinction, which are, perhaps, not commonly in possession, nor practically obtainable. The accustomed phænomena of health, as subsisting in persons of different constitutions, must be carefully and knowingly surveyed, that some conclusion may, if possible, be drawn for instruction and guidance, in subsequent practice and management. This important part of the subject will be materially influenced by the knowledge of the prevalence, continuance, and force, &c. of particular circumstances; of the peculiarities of constitutions, the nature of their exposure, treatment and mental quality, and of many other considerations. Remarkable assistance, in the determination of many circumstances, may be obtained from a distinguishing apprehension of the occurrences affecting the constitutional healthiness of seamen; and which should be comprehended with some more advantage from the miscellaneous illustrations interspersed in this undertaking. Some animadversions of considerable importance which have already been given in the Introduction, will now serve to make these conclusive observations more compendious.

XXIV. An inconceiveable disproportion, or inequality, will be observed to exist in the susceptibilities of different men in receiving unpleasant or injurious impressions, even in apparently a sameness of circumstances; and also in their capabilities of resisting the influence of the exposure to those events with which they may hitherto have been unacquainted. This disparity, or difference, may even be manifested in the same person; although, as far as can be determined, he is exposed to circumstances apparently possessing an equivalent influence upon his constitution. The incalculable dissimilitude of constitutional susceptibility, forms an extensive and important fundamental for the exercise of the ingenuity, judgment, and discernment, of all those engaged in the treatment of the seafaring: a keenness and steadiness of observation will be found necessary, if the requisite attention is duly paid to a subject of such interesting importance. And here it is proper to be known, that the accession of disease, or the commencing departure from the healthy standard or condition of respective individuals, as sometimes happening, may subsist in such a trifling degree as to be difficultly perceptible, even to the most attentive and sagacious: frequently, however, there may appear a struggle between the downfall of health and the establishment of indisposition. Upon some occasions, and in peculiar examples, by a fortunate operation of nature unassisted, (at least not evidently or explicably,) the beginning of distemper may happily be opposed, and even vanquished, and the customary and desireable reign of health confirmed: this, however, is an occurrence not legitimately and necessarily sanctioning an unsuspecting confidence, and therefore, most commonly, the interference of art is commendable. At this point of examination, the supposition leads to that line which may be imagined to intercede betwixt the intrusion and dominion of disease, and the repelling influence of the constitution; but here there is no opportunity for elucidation, but merely the statement of a proposition.

XXV. This tendency to the formation of disease will be modified and governed by an almost innumerable host of circumstances. Sometimes the cause may be less or more observeable, or easily discoverable; but, frequently, it will be indeterminable in all its circumstances: "Causa sæpe latet vis est notissima." Another observation too, the force of which should never be overlooked, is, that a cause which almost instantly disturbs and materially influences one person, will, although applied in precisely a similar manner, and in an equal degree to another, produce no discernible inconvenience. The impetus of a particular mischance, may be fatal to one person, and to another be only the cause of comparatively inconsiderable annoyance. This wonderful diversity of constitution hath continually prevailed; and a notion of the subject may be gathered from the foregoing remarks concerning a particular qualification of constitution, or a gradually confirmed habitude. As this prodigious difference exists in the capabilities, or constitutional circumstances of individuals, enabling them to resist particular causes of disease, so another reflection of practical importance, but difficultly understood, yet a consideration never to be overlooked, is, that a remarkable disproportion also intervenes amongst the effects of remedies needed for their restitution from a state of indisposition. This last consideration has frequently afforded confidence and consolation to the intelligent practitioner, when, otherways, he must have been overwhelmed in disappointment, and his best acts been confounded and entangled in the inextricable involutions of perplexity. The occasional easiness and readiness of combating even great evils under the most unpropitious circumstances, the unexpectedly fortunate issue of very unpromising misfortunes and complaints, by the assistance of seemingly very incompetent auxiliaries, lead to the antecedent conclusions. These observations, in their full energy, can be sufficiently understood only by the marine or military practitioner, the peculiarities and disadvantages of whose station, must have often exposed him to multitudinous inconveniences.

XXVI. The symptoms of many incipient complaints will be liable to a discrepance and modification, not only at their commencement, but also will subsequently be particularly determinable by the constitution and the nature of accompanying circumstances. This conclusion is so veritable and of such extensive application, that it may be remarked, that even the same complaint may exhibit a difference in its symptoms in proportion to their mode of concomitance. The truth of the proposition is so indisputeable, that it is completely manifested in the diurnal observation and practical exhibition of every practitioner. The extensiveness of its application is demontrated in this, that the same practitioner is under incessant obligation to regulate his general management and vary his pharmaceutic prescriptions, when in his power, conformably to the perpetually fluctuating nature of all these circumstances. In minuteness of discrimination, the intelligent and industrious practitioner would, perhaps, divide the prognosticating appearances of diseases into those which may be denominated universally and particularly characteristic. There is often an expressive peculiarity of appearance which immediately demonstrates that there is a declination from the customary point of health; and the enlightened practitioner will be sometimes able to distinguish, even without the assistance of an immediate or particular examination, and to tell of what description is the complaint. The experienced surgeon knows that, among roguish sailors, endeavours at simulation are very common. The presumptive counterfeit is, for the most part, easily discoverable; but it should be remembered, that sometimes it is accompanied with some share of indisposition, and then the ascertaining of the true state of things becomes more complicated. This apparently artificially aggravated state of indisposition is frequent amongst this unhappy class of people; and the imposition proceeds upon the accidental opportunity of employing their cunningness in representing that as a violent disease, which, otherways, can be contemplated as only a very inconsiderable derangement of constitutional healthiness. This coincidence and combination of slight ailment and sophisticated contrivance, may, sometimes, be so slily managed, as to require some acquaintance with the ways of deceitful mankind for their apprehension and satisfactory developement. The unmasking of the counterfeit will also be more troublesome if he is naturally an unlikely wretch, with narrowness and discoloration of countenance, haggard features, grimness and sallowness of complexion, and that thinness or lankness of constitution, which, to common observation, would betoken a high state of unhealthiness.

XXVII. In particular instances, disease sometimes creeps on very slowly and almost imperceptibly, but after a certain degree of progress, by the interposition of some unfortunate circumstance, there is a sudden evolution of serious disorder, which rapidly proceeds to a state of danger. In some, again, of timorous dispositions, when once they are affected with even moderate illnesses, there occurs an inexplicable and unnecessary despondency, and the complaining bend under their feelings, as if loaded with a mischief which is insurmountable. All these and many other things must be taken into consideration when judging of the true or real import of the alteration of the healthy standard, and of the management of the prophylactic administration, as this will be applicable to particular constitutions. An unaccountable conglomeration of appearances, moreover, will occasionally present where no corporeal cause adequate to their production may be distinguishable. A mournful and disconsolate countenance, defective appetite, with the supposed existence and statement of vague or unsettled but painful feelings, restless nights, listlessness, timorousness, and the fanciful conception of unfitness or disability for the performance of wonted duties, with an almost innumerable accumulation of heterogeneous and irreconcileable uneasinesses, and asseverated but unfounded complaints, will all be occasionally recommended to the attention of the practitioner. If the latter is blessed with the requisite discernment and professional acquirements, the detection of the nature, qualities and amount, of the lurking and portentous mischief will generally not be very difficult.

XXVIII. The suggestions, solicitations, and practical memoranda, which have already been introduced in the prefatory observations, will, it is expected, be sufficient to recommend this part of the business to that share of attention, to which it seems to be duly entitled. The propriety and advantage of the acquisition of the knowledge of the differences and peculiarities of constitutions, and other particularly characterizing circumstances, will now obtain, in the minds of the assiduous and diligent, indisputeable confirmation. This distinctive knowledge will be found very serviceable in ascertaining the true state of individuals, and in the determination of the mode of management which may be most consistently applicable. This foreknowledge of all these constitutional circumstances will be unspeakably serviceable, not only in the ordinary course of medical practice, but also most particularly in the suitable detection of the existence of distemper. This last observation is of such immediate and essential importance, that the acquisition of the knowledge of it should constitute a part of both naval and military surgeons' employment. The intelligent commander will also find agreeable, or at least commendable engagement in forming an acquaintance with the general condition of the health of his ship's crew, and also of their characteristic qualifications; and he may thus become an expedite discoverer of the departure from their common state of health, as well as the guardian of their general safety, and the maintenance of becoming regularity of conduct and respectful steadiness of behaviour.

XXIX. A preconception of the nature of the distempers or symptoms of indisposition which may most probably be troublesome, will frequently be entertained from the foresaid necessary information of constitutional capabilities, and the circumstances with which they are ordinarily encompassed. This is a consideration in the vigilant and scientific observance of all the most unfriendly occurrences to which they are continually exposed. The simple or conjoined action of all these things, and others antecedently touched upon, must also be considered and understood in determining the full effect of their application. A reference to the principal matters already examined, their degree of apparent operation, and whether some things have been judiciously but others improperly managed, will be deliberately viewed by the considerate. If the people have been treated with moderate attention and judgment in all these principal and powerfully influencing circumstances, but one, clothing for instance, neglected, or improperly employed, a remarkable difference will be observeable in the consequences. The judicious or unskilful regulation and management of these, in company with other circumstances, must wonderfully determine the fierceness or mildness, the quickness or slowness, of the supervenient complaints.

XXX. The length of time, also, of the particular exposition, will materially influence and diversify the alterations of the condition of healthiness which may be gradually introduced. And this prolonged exposure is commonly remarkably declarative of the inequalities of constitutions, which have been already so frequently mentioned; in opposing and modifying the action of accompanying incommodious circumstances. For it may be called to remembrance, that if the men have been in possession of the proper degree of health at embarcation, or at the commencement of a particular undertaking, and a reasonable attention afterwards paid to their general comfort, and all the forementioned considerations so urgently necessary in the conservation of their healthiness, they may maintain their ordinary health for a considerable time, seemingly, or absolutely unimpaired. The infringement of their health has frequently originated more from carelessness and reprehensible mismanagement, than from the irremoveable unfavourableness of their mode of life, abstractly contemplated. This is a mournful reflection, and especially when the conclusion which it implicates can be applied to any part of the navigation belonging to nations, which are commonly supposed or concluded to have some share of civilization. The continuance of all evils or inconveniences which are remediable is, therefore, cæteris paribus, undoubtedly inexcuseable.

The situation of the sailor, in many instances and places, is susceptible of amendment in its circumstances, consequently the individuals who are obnoxious to manifold annoyances and remediable misfortunes, are capable of experiencing the advantages of improvement. But so much advice and different suggestions for the melioration of seamen's circumstances, have been occasionally introduced in the course of this work, that there seems to be neither place nor need for much additional discussion upon this portion of the department. A conviction of the interesting nature of the subject, and the frequent ill usage of sailors, even in their best circumstances, have perhaps sometimes led into a repetition or a statement of the same radical notion in different manners, but all this, it is hoped, may be forgiven to one, who writes, animated with a sincere regard to his native country, and in the spirit of earnestness.

XXXI. An enumeration of the particular complaints with which the sea-life is generally most assailable, constitutes, as previously and repeatedly remarked, no immediate and originally intentional part of this undertaking. It may, however, be observed that, at present, there is no rational or tolerable disquisition upon their diseases, with their history, treatment, &c. in existence. Most of the professed treatises upon the diseases of seamen are stuffed with nonsense, irrelevant balderdash, or empirical absurdities, and extravagant speculations. But here it must be proposed, and indeed may be considered as a veritable conclusion, that keenness and sharpness of observation for instituting a reasonable determination, will be indispensably requisite, in all cases implying difficulty and uncertainty in their nature and tendency. This information of the natural and undoubted importance of the symptoms or phænomena of indisposition once established, as far as obtainable, a beneficial foundation is thus secured for the exercise of the surgeon's ingenuity, professional acuteness, distinctness of management, and the most serviceable employment of his prescriptions. The practitioner must also distinguish whether there is a necessity to oppose or withstand the disease, more especially, and perhaps exclusively, with remedial efficiency, the adjustment of dietetical assistance, or whether the conjunction of these two circumstances may not more commonly be adviseable. The determination in favour of the combined agency, will almost constantly be the plan both most commendable and advantageous. The physician, without the collateral assistance of a good cook, would very often be found inefficient in the removal of disease, and particularly in the restoration of systematic soundness and constitutional plumpness. Scientifical medicinal administration, and nutritive dietetical exhibition, must, generally speaking, be considered as twin sisters, and mutually and constantly assisting each other, and to the restitution of general health are absolutely indispensable.

XXXII. The opportune detection of the beginning, or primitive sproutings of systematic complaint, (when this is practicable by any phænomena which can be apprehended,) is always an object of the greatest moment, and especially where the natural tendency of the disorder is either rapid, or speedily displaying dangerous and difficultly manageable symptoms. This is oftentimes the disposition of particular distempers, and in some constitutions in every region, in every climate, but in the tropical, &c. latitudes, this quickness of progression and unmanageable stubbornness are more commonly remarkable. In these situations and instances, the space of a few hours will occasionally determine the event of the malady; which unhappily is very often destructive. Indeterminate deliberation, or the irresolution engendered by fearfulness or unskilfulness, and the loss of time by waiting for consultations which are not immediately obtainable, are highly prejudicial; but the advantages of an enlightened understanding and unfluttering promptitude, will, in such circumstances be impressively demonstrated.

> ——" Quid enim? concurritur: horæ
> Momento cita mors venit, aut victoria læta."

This reflection cannot be too strongly impressed upon all concerned in the protection of health, and consequently in the prevention of distemper in all situations, and peculiarly in all the warmer climates. The simple discovery of symptoms, and the possibility of assigning to the complaint a station in a nosological classification, will be wholly inadequate. The contemplation of difficulty, or of hazardous occurrences, without determinate and skilful opposition, would, for the most part, only lead to discouragement and the abandonment of enterprise. Along with the consideration of the visible or pending mischief, there must accompany a firmness and consistency of understanding, a temperate but inductive observance of every circumstance, so that as complete a conception may be formed of individual phænomena, and as comprehensive a view of the whole taken, as possibly can be accomplished. This commended plan of management, however, will need a quickness of apprehension, a discrimination of appearances, and a watchfulness of the changeableness of circumstances, which are only possessed by a few: the diligent, the discerning, the instructed, and the pointedly attentive.

XXXIII. In a discreet medical practice, a difficulty will sometimes occur in the mind of even the reasonable and distinguishing practitioner, whether a person labouring under an assemblage of anomalous, but, for the most part, and at the time, insignificant appearances, or even the indications of some more moderate and definite complaint, should be excused from the whole of his accustomed employment. The reasonable determination of this circumstance will occasionally require the assistance of that knowledge and discernment, which a competency of professional accomplishment and the advantage of an assiduously improved experience are fitted to administer. In addition to those instructions already supplied in the Introduction, a few observations may here be allowable for the guidance of those who may not have, perhaps, attained that proportion of knowledge which is commendable, or rather necessary, for determining on and conducting matters of such importance. The appropriate management must be regulated by a due regard to all circumstances, for without this requisite mode of conduct, as applicable to individuals, the treatment must often be injudicious, and, therefore, too often prejudicial. The peculiarities of constitutions, the predominancy of particular dispositions, the state of the person's mind, the nature of the symptoms with their importance collectively weighed; the state of the ship and the service in which the men are occupied in general, and sometimes the particular circumstances, or even the service in which they may be engaged, or station which they may hold at the time; the present or expected condition of the weather, and many other circumstances, but especially the nature of the diet and the length of time the people in the supposed condition may have been exposed to some of the causes which might probably have engendered the states of indisposition contemplated; must all be considered and taken into account, and after all, in some perplexing instances some difficulty may remain in deciding upon the subject with confidence and propriety.

XXXIV. If a very particular share of duty is not assigned to any-one, as long as he retains a moderate portion of strength, and his appetite remains tolerable, he should seldom be excused entirely from some exercise, and more especially when his particular disposition involves nothing of importance. The untimely admission into a sick list, and the immature indulgence thereupon, would frequently, with the dissolute and worthless, be the reprehensible encouragement of laziness and idleness. Many slight ailments may speedily and happily be overcome, when nothing of a particular description interdicts, even while the persons continue some gentle service, or proportioned in conformity to the actual condition of individuals. This exercise, however, as already mentioned, under the guidance of the intelligent, will always be carefully regulated, agreeably to the circumstances of individuals. And for instituting this distinction with propriety and benefit, the judgment of those conducting in peculiar situations must be the rule for administration. But unhappy must be the forlorn wretches when this judgment is darkened by ignorance or bewildered in misconception. The skilfully adjudicated management of exercise may often be considered as a valuable preventative, and certainly, also, as an efficacious restorative application. And this practical conclusion is especially suitable to those who are naturally predetermined to slothfulness, and a cumbersome disinclination to any commendable undertaking. The loitering lubber, if his understanding were as enlightened as he is intimately acquainted with the gratification of his sluggishness, might explain his resolutions in oratorial language,—" An ego quum omnes caleant " scilicet labore "ignaviter aliquid faciam."—After advancement to a certain age, and especially if this is accompanied (which, as before observed, too commonly happens amongst sailors) with premature deprivation of constitution, or after a certain degree of constitutional derangement, but which has been brought on without any evident special cause, there is the appearance of thinness, and the existence of considerable debilitation; upon careless inspection, such an individual may seem to be in a state which is very unpromising, and, to uninstructed apprehension, he may appear to be altogether disqualified for any employment. As before signified, where there is a deceitful disposition, this semblance of incapability is often ingeniously heightened by contrivance, and a multitude of assumptive inconveniences and uneasinesses are obstinately held forth, as invalidating considerations to officers and commanders. Lameness and stiffness, and a heterogeneous accumulation of annoyances, pertinaciously counterfeited, are also some of their subterfuges. The disqualifying appearance of these seemingly toilworn fellows may frequently be appreciated, the disguisement disentangled, and the ascertainable effectiveness of the dissimulator reduced to its due admeasurement. These observations, although they may seem inapplicable to the subject under contemplation, are, nevertheless, justly deemed of the highest usefulness in the maintenance and conservation of healthiness. The judicious introduction of a suitable dietetical alteration, and the combined efficacy of a little medicine, will often speedily, or in a few days, accomplish what could not possibly have been expected.

XXXV. A few notes on the management of revalescents may, likeways, not be altogether improper. The nice apprehension and estimation of the redintegrated capability of individuals who are under professional administration, must variously afford exercise to the judgment and discernment of the practitioner in attendance: for here the prescription of specifical regulation would be most presumptuous and inconsistent, and even very frequently inapplicable. A distinctive knowledge, as appropriate to the circumstances of individuals, will be most commendable and advantageous. The complete overthrow of the complaint, or the progressive instalment of healthy quality, will, therefore, be a consideration, from the absolute condition of which the regulating conclusions will be most lawfully and consistently obtainable. The propriety of the return to duty must be determined greatly by the state of the patient's constitution, and also in a considerable degree by the nature of the foregoing disease. For example, a thumping muscular fellow, and who is perhaps youthful, is attacked with some illness, but the cause of which has been speedily arrested by a natural effort, or by judicious medicinal assistance, and all the functions of health are quickly reinstated, only a trifling reduction of his wonted bulk is the perceptible consequence: it is probable that such a man will return, without much delay, to his customary services. The man, on the other hand, who has long struggled with a lingering and deceitful distemper, will be in a state very different from that of the former: the corporeal and mental powers will have suffered a wonderful diminution of their firmness and promptitude. The corporeal functions and the mental faculties will continue for some time afterwards tremulous, enfeebled, and irregular; and not be conveniently associated, nor so governable by the act of volition. The restoration, too, in common marine practice, as is mournfully understood, will be generally dubious and tedious in proportion to the inconvenience of all accompanying circumstances. The unsuitableness or insufficiency of diet, will often be the cause of lamentable retardation to curative intention, and what is still more grievously perplexing to the humane observer, of insupportable disappointment.

XXXVI. The forementioned advantageous knowledge of the exact state of the person's abilities, both relatively and absolutely considered, must at all times be peculiarly adviseable; but even something more is requisite—an acquaintance with the circumstances of season and locality and with their qualifications, will be highly necessary. If the patient is too soon returned to duty, there is a probability that he may have a renewal of his disorder, or perhaps he may be assailed by another, displaying some difference of character. After a certain degree of strength is regained, and all other things favouring the general design, they should commonly be trusted under the influence of moderate exercise; but both officers and surgeon should remember the poetical admonition:

> "Est modus in rebus; sunt certi denique fines,
> Quos ultra citraque nequit consistere rectum."

Some men, after they have been for a length of time under the shelter of an excusing medical return, become strangely listless and languid, and not again conveniently inclineable to the performance of their customary occupations. Occasional excitement will here be adviseable, and if ingeniously attempered to the state of the individual, will be beneficial; or where the person is unreasonably timorous, hesitating, and easily intimidated, some consolatory exhortation will often be very serviceable. In such cases, after a considerable share of constitutional firmness has been restored, together with a regular appetite and complete evidence of progressive amendment, &c. their return to some occupation, modifiable both in its degree and continuance, in conformity to their fitness, seems highly commendable. This decisive but prudent conduct, if judiciously regulated, will frequently be the means of hastening amendment, and ultimately, restoration, and of preventing also in some persons a renewal of the disease, or occasionally, and perhaps not unfrequently, the generation of another complaint. The determination of not being irresolute with those who, for trifles, endeavour to seek protection by means of a sick list, seems to be so justifiable, and at same time so proper, as to be considered as a preventative of different forms of distemper, which might more or less disqualify for general usefulness. This conclusion, indeed, seems so applicable, and confirmed too by personal observation and experience, that it should be ever held in view, as without this precaution, some examples of lubberly loitering fellows, when slightly indisposed, might be indefinitely protracted, and thus the medical man's report be continually disfigured with almost the same monotonous statement. And here the old story revives, of the frequent difficulty experienced by surgeons in every situation of marine practice, but particularly in merchantmen, in which there are no regular allowances for the purpose of restoring those who may have been reduced to considerable weakness by any complaint. A propitious conjunction of things must operate to the fulfilment of a particular design, and if the happy union contemplated be disappointed, the same advantages will not be attainable. The benefit of a suitable aid from diet will again engage the thoughts of the surgeon, who has had too frequent reason to bewail the scantiness, incompetency, or unfitness of his dietetical allowances.

XXXVII. The appropriate coadjutancy of temperate exercise, with scientifical prescription, pure air, proper clothing, cleanness, &c. will be of inestimable advantage. The skilful surgeon will also make a correspondence in the adjustment of action to the degree of recovered strength, and in proportion to the concomitants of the person's exposure. The diversity of climates, the sudden transition from one of a particular to another of a considerably dissimilar description, will also be circumstances of importance to be held in the remembrance of the thoughtful. The propriety and necessity of a knowledge of the atmosphere, with all its changeable qualifications, will now not require demonstration. A man recovering or nearly restored from some disorders, will be speedily or instantly plunged again into disease, if he should unwarily and improperly be exposed to moisture or rain, and especially if this is accompanied with a depression of the ordinary degree of heat, or if his exposition hath been prolonged, or if after such exposure he neglects the changing of his apparel, &c. And contrarily, if he should commence his exposure in dry weather, his restitution might likely remain unaffected; and by judicious attention to all his œconomy, his restoration might be progressive, and at last complete. These or such consequences, however, will more especially appear after particular complaints. Disorders of the bowels, of the lungs, of the throat, and of the different articulations, and intermittents, &c. will be most commonly succeeded by these inconveniences. In many shattered and half-worn constitutions, the indelible remains of some complaints are occasionally manifested by particular sensations at changes of weather, so that some of these ticklish people become what they humorously style walking or living barometers.

XXXVIII. The intelligent surgeon must also be prepared for the observation and distinction of symptoms, or their variegated assemblage, which rarely present on dry land. He will, also, observe that certain diseases are principally remarkable in his marine practice, and that his practice will generally be confined, more especially, to the treatment of complaints of a particular description. This observation, however, must never on any consideration whatever, exclude the possession of a store of knowledge which is promiscuously applicable. And another remark may be made, and which will be worthy of his sincere attention, that he will sometimes meet with an uncommon confluence of irregular symptoms, either in different individuals, or in the same person conjunctively miscellaneous. These confusedly congregated and seemingly irreconcileable appearances, especially, in his first outset in marine practice, will to him constitute difficulties and causes of perplexity, almost as insurmountable as the synonymous terms of his vernacular language. Confidence, however, founded on rational principles, and an adequate preparative qualification, must enable him for conquering all removeable opposition. This coincidence of heterogeneous symptoms may sometimes seem to exist in such a degree, that the distinguishing of the prevailing or principal complaint may cause a difficulty of no inconsiderable magnitude. This accidental confusion will occasionally be the cause of unsteadiness and indecision in determining the reigning disorder at its commencement. The usefulness of the acquisition of the knowledge of discriminating the characteristic appearances of distempers, respectively and individually contemplated, will, therefore, be strongly manifested. This preparative professional knowledge, too, is absolutely requisite for the proper detection of particular complaints at their beginning, and even for their distinction in their progression; at their commencement, particularly, the preventative applications can be used with the most promising expectation of advantage.

XXXIX. The practitioner having, as far as practicable, determined the nature and amount of the principal complaint, must at same time decide whether the incidentally accompanying, but not necessarily constituent symptoms, be of any real moment with reference to the disease which may imply the principal consideration. This commendable investigation accomplished, the next point deserving the special regard of the medical officer, is whether the restoration of the desireable poise of health is to be attempted while the person is retained in a state of confinement, or whether he should continue in his accustomed, but modified occupation. The resolution of this proposition is determinable by the whole in aggregate, and from what has already been said in various parts of these observations, any further animadversions are surely unnecessary. As this is a subject of great interest, not only to marine practitioners, to sailors, but also in a singular degree to the Public Service in which they are all engaged, the considerations and illustrations upon it have extended further than what was originally supposed. These commendations have been suggested with a benevolent intention to fellow-labourers, to encourage them in their frequently irksome sojourning, to enliven and animate them to a sense of steadfast diligence, and to prompt them to activity and to habits of minuteness of investigation and carefulness in discrimination.

XL. As a dissimilitude of appearances will occur, some diversity in the practical and preventive administration will therefore be an object requiring attention, according to the difference of stations, voyages, cruises, and all the disparity of variable exposure. After a particular lengthening of such exposure, the practitioner will be more watchful than ordinary, for then some of the indications of disease may be observeable. The speediness or slowness with which these premonitory and distinctive phænomena may be unfolding themselves, will be unequal, according to the favourableness or unkindness of circumstances; for it is highly worthy of remark, that this may have an unexpected but extensive influence, either in facilitating or retarding the formation of disease. This difference of circumstances is one of the causes of that unlikeness in the state of health in different ships, apparently exposed to similar concomitants, and originally also in all appearance, in possession of an equal share of health and constitutional durability. This conclusion, it must be observed, applies more particularly to circumstances generally, and of these the state of the atmosphere or weather, the people's exposure, the service in which they are engaged, and the general supplies of dietetical allowances, are the principal. But their state may be modified by a more particular concurrence of circumstances: by the correctness or impropriety of discipline, the nature and condition of the ship in which they serve, the moderation or severity of their labours, the state of their mental feelings, the precise state of their accommodation, cleanliness, &c. and to these may be added, the exact mode of victualling; and, what would seem of high moment, is the medical management, for through ignorance or inattention in the practitioner, in some circumstances, a considerable part of a ship's company may be brought to suffer in their state of healthiness.

XLI. A distinction must also be made betwixt what are undoubtedly and specifically the characteristics of formal disorder, and those anomalous appearances occasionally induced by irregularity, &c. or by some act of imprudence. Sometimes the fellow who has taken a brisk dose of grog in the foregoing evening, will next morning make application for assistance, and will upon these occasions strenuously endeavour, by misstating, to mislead the medical man's attention. He will now mention a number of grievances, how he had a restless night, perhaps, some chilliness, and that he is pained all over, that he has headache, that he cannot eat any thing, and perhaps he will say that he has been vomiting, and that he is also affected with looseness. The intelligent practitioner does not require any collateral suggestions; the man's character, and every accompanying circumstance, will tend to demonstrate the nature and amount of the inconvenience. Irregular symptoms may also originate from an almost innumerable host of other unthought-of causes; but these accidental and temporary disturbances, will, for the most part, be easily distinguished from those which may imply anything serious in their nature and tendency. Sometimes, however, a very dangerous complaint, at its beginning, may only present symptoms which are seemingly unimportant. Another consideration of importance in conducting the surgeon through some of these nameless, but truly distressing difficulties, is, that frequently some lingering, but still imperfectly delineated, or strangely intermixed symptoms, may occasionally show themselves, and when it will not be easy for him to foretell, with any exactness, of what complaints they may be the forerunners.

XLII. This doubtful and indecisive character of indisposition will frequently depend greatly upon both the bodily and mental state of the individual, the length of time he may have subsisted on sea-diet, the state of the ship in which he serves, and the peculiarity of the treatment he may have received, with all the other things with which he may ordinarily be encompassed. After a ship's crew hath been restricted to the use of the marine mode of victualling for several weeks, the medical officer should be observant of the different alterations, which may indicate the smallest deviation from the natural state of health. All other circumstances not unfavourable, these appearances of departure from the equipoise of health will, commonly, first declare themselves amongst those who have passed their meridian of strength, and who feel the gentle pressure of decay; or those who have previously suffered the hurtful influences of painful or prolonged maladies, or those who are commonly drooping and disconcerted, or the slothful, or those wallowing in dirtiness, (but this latter is luckily seldom allowed in the regular Public Services,) irregularity, &c. whereby the constitution incurs, although too commonly unobserved, yet, certain mischief. The knowing officer and discerning surgeon will often distinguish the men, even at the commencement of an undertaking, who may subsequently be troublesome in management, and frequently needing professional assistance. If the disqualifying circumstance seems to arise from any blameable misconduct, and thus in a considerable proportion artificially induced, or a trifling illness intentionally and villanously amplified, some degree of sharpness with the offender will be adviseable. And when a man of this disposition is manifestly in possession of sluggish but unemployed strength, and who is a fit subject for fostering disease, some stimulation and application of regulated employment must be highly commendable.

XLIII. A complete catalogue of all the anomalous and perplexing phænomena of imperfectly characterised distempers, their infinitely diversified modifications of association, &c. would far exceed possibility, and cannot, therefore, be here expected. The outlines of such an extensive and important subject can only be attempted as a commendation and encouragement to successors, to indefatigable perseverance in investigation, and to the progressive attainment of serviceable knowledge. In the sea-life, but happily not so often as heretofore, the existence of scorbutic ailment was a common cause of inability for general service. This complaint may commence and subsist for some time, like some other disorders, without any outward declarative symptoms. There is, however, a particular qualification of constitution shortly preceding the evolution of scurvy, which threatens to disable the person labouring under the affection from the fulfilment of his accustomed performances. This general condition is ordinarily attended with variable degrees of weakness, indifference, and the irksomeness of irresolution. The honest seaman applies to his surgeon, and renders a faithful and natural, but not very luminous account of his feelings. But often, however, he can only mention that he is unwell, and cannot inform him exactly what is the matter. He complains of weakness, principally, (this is commonly first in the list,) that his knees are feeble or totter under him, and that he has uncommon stiffness in the limbs incommoding their free movements; that he has pains springing and wandering along the different extreme members, and he now very probably grasps the upper arm, and tells the surgeon that he cannot, or with difficulty, raise his hand to his head; and if he is narrowly observed, all this will be done with an air of unaccountable sorrowfulness, and under the appearance of unwonted discouragement. He goes on to state, that his general health and strength are greatly impaired, and that he is unable, but willing to do his duty, which, he is sorry to relinquish. He furthermore relates that his appetite is imperfect, and especially, that he hath ate no flesh meat for a length of time, which he, then generally, specifies; he also mentions that he is troubled with restless nights, and if the complaint has made some progress he is, perhaps, affected with looseness, or that his bowels are irregular. The liveliness and complexion of his countenance have by this time undergone a considerable change, with an expressive appearance surrounding the eyes in the course of the musculi orbiculares, &c. Upon inspection, the tongue will generally be observed to be loaded, and the state of the stomach to be incorrect. The roguish sailor, in a similar situation, conjoins and jumbles with his statement a large share of nonsense and untruth, and distorts every thing as much as possible from the point of reality, but with the expectation of answering his own deceitful purposes.

XLIV. Scorbutic affection, either in a more concealed or manifest form, is a frequent source of annoyance, and also, it may justly be said, of that unfortunate predisposition to constitutional exhaustion, and premature production of the commonly attending qualities of old age, which are so ordinarily and grievously remarkable amongst the seafaring. In particular constitutions, it may exist for some time before it is discoverable by any indubitable pathognomonic characteristics; and, certainly, without several of those which have hitherto, by most treating on, or managing this disease, been considered as necessary to manifest the existence of this complaint. It may exist in all possible degrees, from the very commencement of change imperceptible, to that stage in which it is attended with danger, or induces unexpected and precipitate dissolution. These suggestions will be sufficient to convince the surgeon and others interested in the protection of health, of the propriety and usefulness of carefully and seasonably distinguishing those distempers which may still be susceptible of removal, while the person is performing his common services, from those which may be happily conquered almost immediately after their formation, and from those, too, which unavoidably demand less or more confinement, and particularity of management. At the same time, the practitioner will devoutly carry in mind, that many disorders are at their beginning instantly removeable, whereas, by delay, neglect, and misconduct, they acquire a footing and systematic dominion, which are afterwards to be overcome only by perseverance, and the aid of regular and skilful medicinal exhibition. And if this were professedly and strictly a medical treatise, it might here be remarked, and which, indeed, should constitute a powerful and continual argument with all concerned in the keeping of the balance of health, that many disorders, after they have passed a certain stadium of progression, may unhappily be considered as irremediable.

XLV. The forementioned expostulations have been introduced, purposely to establish practical assiduity and distinctive keenness in the detection of incipient disease, and thus indirectly to form a salutary means in the conservative administration. A legitimate and universally regulating conclusion may now be drawn from all these promiscuous observations, that diligence and distinction are necessary attributes in all those who undertake the management and preservation of the health of seamen. The proportionate comprehension and scientifical discrimination of the primordial symptoms, their express nature and degree, and of what distemper they are specifically characteristic, whether of a topical or general nature, will be of the greatest consequence. The accomplishment of these desireable purposes will be of essential moment and utility, both in the prevention of formidable complaint, and in its removal when unluckily introduced and established. These few remarks are intended to have a special reference to the prevention of distempers on shipboard. But the general tenor of all the preceding notations, is to establish the propriety and necessity of preventing all diseases as far as practicable; or in other words, of maintaining constitutional healthiness. This has been repeatedly declared to be of particular importance in the Public Services. The great and generally operating principles have been considered, and some of their influences explained and practically applied. The subject is both extensive and of remarkable importance, and virtually essential in the defensive and commercial employments. It has hitherto been too much neglected, and unjustly considered as only a secondary object in the general preserving and regulating discipline. Some of the foregoing circumstances are of vital interest in the temporal comfort, and even safety and existence of mankind. It may be observed, that beside the foregoing considerations, some additional suggestions may be made in reference to the exclusion of contagious distempers, which might otherways spread mischief and dismay, and, perhaps, be sometimes difficultly overcome.

XLVI. Some reflections upon the usefulness of ascertaining the freedom of those embarked, from harbouring any rudiments of diseases which can be communicated, may, therefore, be introduced. The first question with those who have to determine, must be, whether the people collected may have been obtained from places or situations of a suspicious description, or in which contagious disorders may reasonably or intelligibly be understood to be, or lately to have been, predominant. The solution of the inquiry must be obtained in various methods; from interrogation, from investigation when practicable, from the general appearance and also from the particular state of the men themselves, &c. For, frequently, in those retaining the seeds of any diffusible complaint, there are some characteristic or pathognomonic appearances, which the keen eye of experience will determine to originate from the presence and peculiar operation of lurking mischief. The phænomena will also differ considerably according to the state of constitution, the actual nature and strength of the morbific cause, the length of the time of its continuance, and several other circumstances. These are considerations of interesting importance, and for the discrimination of which the medical officer should be suitably prepared, as the defence and protection of the health of others may depend upon the opportune unfolding of the cause or causes of disease, even in an individual.

XLVII. Another consideration influencing the general conduct in these affairs, is the existence of the matter capable of infecting, or causing disease by contagion, or the action of *touching* or *contact;* in conditions which are different in relation to the sources from which it is proceeding. Those materials with, in, or on which it may be lodged, may either be animate or lifeless; and the speediness or comparative slowness of its diffusibility and consequent propagation, will, likeways, depend very much on the actual state of accompanying circumstances. The nature of the fomites, as they are frequently, but rather unmeaningly denominated, that is, the substances which are supposed to be impregnated with the morbific contamination, the condition of the person or persons capable of imparting the mischief to others, must also be duly considered;

and also the susceptibility of those to whom it is communicated. The state or degree of atmospheric temperature, the closeness or freeness of the place appropriated to the people's accommodation. A person may retain in his possession, perhaps, embodied in his raiment, the matter capable of generating disease, and before it produces in him the common symptoms of the particular complaint, it may in others be unexpectedly productive of the specifical characters of the distemper which he hath clandestinely communicated.

XLVIII. And a remark of a still stronger and more important nature is, that the person from whom the disease was received may for some time afterwards show no signs of indisposition. In this manner, then, a person who is either not immediately susceptible of the morbific influence, or upon whom it does not produce the customary operation, may, nevertheless, constitute the intermedium of communication. The person or persons, therefore, who seem to possess even a fair state of health, may be dangerous to those who are unaccustomed to such impressions. Diseases have thus, without any assignable or evident reason, been frequently and mischievously propagated. Another way in which the poison may be conveyed, and sometimes without suspicion, is by means of a person who hath previously undergone its morbific operation, but who at the time supposed, hath probably regained a certain share of his common condition of health, and usual aspect, and thus there may be no suspicion of his being a dangerous associate or neighbour. In circumstances of this description, the communicable evil, unless soon after the existence of the evident state of disease, is, or may be supposed most probably to be lodged in the garments, or other appertinances of the convalescent capable of harbouring and concealing, for a time, the matter of infection. If a person thus venomously qualified and charged with danger to others, had been previously and thoroughly cleansed with all his habiliments, a prevention of future evil might thus have been immediately obtained. The morbific mischief may also be conveyed by the clothes, bedding, &c. or other remains of those who have suffered or died from infectious distempers: in this manner maladies have been imparted to surviving relatives or friends, even at a great distance, and length of time, from the original place and instant of actual operation. From ignorance of, or inattention to these and such circumstances, disease hath been frequently and injuriously disseminated amongst a great part of a ship's company.

XLIX. The intelligent practitioner will, likeways, understand that the infectious property of some disorders is much more powerful and diffusive, and afterwards less restrainable, than others commonly reputed to belong to the same head of classification. The peculiar infection of chincough, for example, of small-pox, measles, and some others, are less under command than that which is occasionally generated in febrile diseases, but whose virulence and consequent diffusion, are commonly owing to closeness of apartments, undue crowding of those labouring under its influence, misconduct on the part of the sufferers, or practitioner, unsuitable management, and many other circumstances. On these accounts, such misfortunes prevail chiefly in the miserable habitations of cheerless and helpless indigence, where the suitable precautions for the safety of health are seldom regarded, and in which places, when the dominion of disastrous complaints is once established, it subsequently takes encouragement from the inconvenience of their circumstances, the awkwardness of their ordinary accommodation, and the insufficiency or improprieties of their maintenance. But the hovels of poverty do not alone present these miserable spectacles; crowded and ill-managed ships have been too frequent examples of such misfortunes. The naval or marine surgeon, however, hath nothing which in these latter times should be a cause of dismay to him, provided all is under distinguishing management. If he is a prudent and intelligent man, therefore, he has little to dread from the introduction or accidental occurrence of common fever; but of these, the former is the most unpleasant and hazardous, as it indicates the existence and operation of an imparted complaint, whose pervading influence may be powerful, and extent of force unknown. But even here, the scientific practitioner must not become tremulous and indecisive; for by distinctive conduct, unless the accompanying circumstances are very unfavourable, the reigning mischief may soon be quelled. The fortuitous formation and occurrence of fever which, in the larger vessels, are generally conveniently conquerable, need constitute no cause of alarm, excepting in the grossest ignorance, neglect, or ill management, or in some accumulation of unpropitious circumstances.

L. The protection of health, therefore, will in some measure depend upon the exclusion of infectious distempers, and more particularly upon debarring all those which, when introduced, are the most troublesome, or afterwards the most difficult to be overcome. All those diseases, then, which are not easily tractable by the ordinary plans of opposition and treatment, should, as far as human foresight, prudence and information allow, be always excluded by the most determinate precautionary management. The small-pox, different febrile ailments, even the horrible distemper, plague, as it is emphatically denominated, may thus, in general, be prevented. This appears to be a pleasing reflection to those who are commendably employed in the commerce, defence, &c. of their country; that they may thus be secured from some of the most calamitous disorders, by precautions involving no particular difficulties, no mysterious, no unaccountable or inexplicable applications. The unlimited diffusion of infectious distempers, formerly constituted a source of frequent mischief and mournful destruction. The principal complaints which seafaring people have to fear are measles, influenza, seldom occurring, small-pox, which are happily lessened in their violence, curtailed in their spread and deadly influence; chincough, and fever possessing infectious property when unluckily imparted. Some of these, from the inconceiveable extensiveness of their propagation, and this, too, through the atmosphere, are not ascertainable in their communication, nor yet susceptible, by any human effort, of a determinable circumscription. But a most acceptable consideration to all those who may dread the evil, is, that the most dangerous are more easily prevented by moderate distance and precaution, than others which are commonly considered as not so dreadful. Even after the lapse of so many ages, after so much observation and inquisition, so abundant are the folly and ignorance of mankind, that it remains a question to be determined by the judges, whether Plague, that awful scourge of all ages, be an infectious complaint! This remark might lay the foundation of much discussion and important disquisition; but the simple statement of the fact must, here and now, be deemed sufficient.—Since the above was written, it has been very lately declared, by a majority of sapient opinions, that the Plague is infectious.

LI. As the avoidance of the original excitement, or admittance of complaints of a contagious description, should always be deemed an indispensable consideration, a requisite precaution for those managing the protection of health will be, in the respective situations which they may occupy, to ascertain the particular healthiness or insalubrity. For, it must be remarked, that seamen will be exposed to much more danger in some than in other localities. At anchorages near towns, or other suspected places, the general condition of health should be a subject of inquiry; for if any spreading disorder should exist, the less communication they have with the people on shore, there will be a diminished probability of their receiving any complaints. Correspondence with such suspected places should be managed with much prudence and discretion, and only steady people employed upon such occasions, who are concluded to be sedulously observant of their regulating instructions. This observation may be made, that seamen are generally not very delicate in their sentiments, and perhaps less in their behaviour, and therefore, they almost certainly pop into the wretched hovels and abodes, where complaints of the aforesaid description are so frequently subsisting. In this manner, fevers, small-pox, measles, &c. have oftentimes been communicated. The prevention of promiscuous or indiscriminate intercourse, in all places in which infectious diseases may predominate, should be most pointedly regarded. By injudicious management, together with the customary effects of sailors' irregularity, drunkenness, and a vast assemblage of mischievous concomitants, diseases of an infectious description, as just said, are too often the more remarkably incapacitating consequences.

LII. Men intended for the naval service are commonly, after their impression or voluntary submission, but especially in the former manner, assembled in hulks, or other vessels calculated for their temporary reception. These miserable receptacles, from their frequently incompatible or inadequate largeness, their crowded condition, and also from the previously unhappy state of many of those forlorn and unhappy creatures; become the holds of disease, sometimes, little short of pestilence, of inhuman cruelty, and to the sufferers the cause of rending despair. From this apparent unkindness, frequently an invincible hatred to the service, and sulkiness of disposition, are engendered, which lay the foundation of schemes for desertion, or at least an ungraceful obedience to those in command. This mode of detention or confinement, is unluckily a mischievous imperfection, in one of the Public Services of a nation, even virtually denominated civilized and powerful. But as the attention is now chiefly directed to considerations which may affect constitutional healthiness, and consequently may be productive of distempers, the morality of the business does not necessarily come under particular investigation. The unfortunate occurrence of disease may be owing either to infection conveyed by some of the tenants of these dreary abodes, or to the contingent generation and evolution of the mischief in these execrable places of confinement themselves. The hurried transference of men constrained into the service, or by what mode soever they may have entered, seems to be a culpable method, and has been often productive of violent and spreading distempers. This circumstance appears to demonstrate the propriety and usefulness, of minutely and critically inspecting all suspicious individuals before their embarcation, and intermingling with ships' companies; and if judged to be adviseable, that they be suitably placed for probationary investigation. And here it is proposed, that those machines of temporary reception, whether intended for the foresaid purpose, or simply for confinement, should never be so crammed or crowded as to endanger the generation of infectious complaint. And moreover, if the principles relating to cleanliness, to ventilation, to clothing, &c. have been inculcated with such earnestness, everywhere in a sea-life, in such situations as those lately mentioned, such precautions are justly considered as essentially necessary.

LIII. These remarks refer to points of general interest; but a more particular examination of such an important matter does not seem unprofitable. The management of the newly collected men should be more particular, previously to their distribution into other ships, and they should be accurately surveyed regarding their actual state of health, the condition of their clothing, &c. and when considered requisite, from an investigation of all circumstances, they should be passed through different processes of purification. And here a consolatory observation may be made, that their freedom or exemption from infectious disease may generally be speedily ascertained. There is something in the appearance of a person labouring under the influence of infection, which is sometimes peculiarly expressive, so that those much accustomed to this subject, (the medical attendants on hospitals, for example,) can in many cases almost immediately pronounce what is the nature and amount of the complaint. Superfluous it would be here, and unnecessary to enter into a description of the appearances which may be considered as characteristic; superfluous, because the history of the symptoms, &c. of diseases must be learned elsewhere; and unnecessary, because more than description is required by those who would be inclined to acquire an intimate knowledge of these circumstances: they must read the signs as depicted in the volume of nature, and lay up the valuable treasure in a memory which may not treacherously beguile the possessor. "Nam continuò has leges æternaque fœdera certis imposuit natura morbis.—Sunt enim quædam proprietates hominum, sine quarum notitia non facile quicquam in futurum præsagiri potest. Facile itaque securus est in his aliquis, quæ sæpe sine periculo evasit." With regard to the Public Service, this reasonable discrimination is of the highest consequence, and disregard or incongruous management of this part of the subject has plunged a whole ship's company, or what is still more disastrous, the greatest part of a squadron, into distress, disability, and calamity. This misconduct is, therefore, the more inexcuseable, because the state of the whole matter may, commonly, be determined in a space of time of no extraordinary continuance.

LIV. Where the smallest ground of suspicion exists, the people should be subjected to particular inspection, and the operations of depuration, both of body and clothing, should be instantly commenced and prosecuted as far as may be deemed to be advantageous. As such men are generally procured in a state of corporeal dirtiness, and squalid clothing, the suitable attention must be paid to both, and while they are retained for a few days, for the purpose of ascertaining their true state of health, this scrutination should be conducted with discernment, and every indication of good health, or deviation therefrom, should be carefully and distinctly noted and considered. And here a very necessary and profitable suggestion occurs, for the attention of those who are not familiarly acquainted with the recondite distinction of the faintly, or imperfectly and doubtfully represented boundaries of health and disease, which is this, that such people may sometimes offer the semblance of complaint, when there is absolutely no particular or defineable distemper in existence. These unfortunate and miserable creatures, upon their first impression or enlistment, commonly exhibit an unhealthy squalid aspect; covered with filth and rags, and vexation and despair marked in their visages; and commonly representing the general mien of feebleness and extenuation, they will, in ordinary observation, have the appearance of indisposition in a state of considerable advancement. A transmutation of their treatment and circumstances, however, where there is no subsisting deeply-rooted mischief, also produces an unexpected alteration, as fairly shown in the improvement of their appearance. The comparative spaciousness of the apartments allotted to their accommodation, and the evidence of attention and kindness to their common welfare, and the procuration of all the happiness of which their station is susceptible, will be serviceable; and then, instead of melancholic dispositions, and detestation or abhorrence of the service being the predominant considerations, their countenances will be illuminated with a radiance of cheerfulness; and promptitude to the execution of their undertakings will be an acceptable manifestation of their willingness.

LV. After they have been properly cleansed, suitably clothed, and have received a few good meals, the prospect brightens, and new feelings beat through their constitutions. If there is no appearance of harshness, or roughness experienced, their disconsolate physiognomies now assume an air of liveliness, and the face which lately exhibited, perhaps, the haggard aspect of disease, will now wear the resemblance of more encouraging and comfortable healthiness. Their unfavourable appearances, the consequences of accompanying unpropitious circumstances, should always be judiciously distinguished, from those more immediately characteristic phænomena of particular complaints. These things are, or ought to be, so well known to those who have carefully attended to the annoyances and hardships of their countrymen in the Public Services, as not to demand much illustration. The actual presence or existence of disease, however, must be carefully and discreetly ascertained, and a difference instituted betwixt what is actually disease, and its sophisticated representation. An advantage of considerable magnitude redounding from such opportune distinctions, is this, that the sooner those not harbouring the rudiments of disease, (and especially when this is of an infectious description, or are positively under its pressure,) are forwarded to station's where they may be less restrained, and be engaged in some employment, the usefulness of the plan will be the more conspicuous.

LVI. Those who are found to be imbued or infected (the genuine import of the term is here supposed to operate) with disease, should be instantly separated from those who are sound, and the more capacious the apartments into which they are translated, so much the more commendable and advantageous. The ventilation should be universally communicated, the ordinations of the goddess of cleanness should be maintained inviolable, and regularity and subordination should never be counteracted by any transgression. This, indeed, will be a fit occasion for giving the men some lessons upon the benefits of a faithful observance of cleanness, and which they must be enjoined to cultivate most assiduously. In the management of this preliminary and preparative purification, and determination of capability and constitutional soundness, a general method of procedure will not be sufficient. Some attention must be bestowed upon the circumstances of individuals, and even a distinction should be made between the state of indisposition which may originate, almost exclusively, from the state of constitution, and that compound state of complaint, sometimes the consequence of a modification of intellectual qualification. This position may seem dark to those not much accustomed to closeness and minuteness of investigation, but by those oppositely prepared, the combined influence of corporeal disease with a modified state of the mind, will be more thoroughly apprehended. The difference, therefore, subsisting betwixt confidence and despondency, will, by the judicious observer and discriminating superintendent, be duly taken into calculation. Depression of spirits, as it is vulgarly called, will most materially, and even beyond all ordinary conception, influence the state of those labouring under infectious disorders, and especially those diseases which are strictly and simply of a febrile nature. These fundamental and regulating considerations, if understood or comprehended, should preclude the risk of misconception, and subsequently, that of mismanagement.

LVII. This discrimination, and the treatment instituted thereupon, seem to be of such essential service, in ascertaining the existence of particular diseases, whether unaffected or as influenced by the concurrence of other incidents, as to be considered of the highest moment, both in the attempts immediately applied for their removal, and, likeways, to the interruption of their continuance. The phænomena of many complaints are much altered by the state of the mind, and almost an innumerable host of other circumstances; and this conclusion is especially applicable to the unhappy persons who are the more immediate subjects of contemplation. The apparent aggravation of many distempers, and even that squalid mournful aspect, (yet not precisely and distinctly exhibiting the characters of particular complaints, but only the beginning, or more correctly speaking, in many, the morbific predisposition, or that systematic condition, by which the person is rendered more opportune to the actual seizure of disorder,) often originate from the unavoidable and unfortunate quality of their circumstances. And as lately proposed, and here again earnestly presented to attention, this should always be sufficiently distinguished from the state of disease formally established. And here it may also be remarked, that although many of the men collected, be seemingly in the enjoyment of moderate health, yet, in reality, they may have the seeds of disease lurking in their possession. This constitutes another point of critical inquiry to the ingenious medical attendant, the appropriate and inoffensive determination of which will sometimes form a subject of considerable magnitude, and one undoubtedly of high importance.

LVIII. This poisonous colluvies may be incorporated in their apparel, bedding, or other substances fit for its temporary lodgement. As formerly mentioned, mischief has been thus conveyed by the garments of the ailing or the dead, and afterwards burst forth into activity, and spread with virulence to the neighbours. The danger resulting from this source, which is so diffusive through ignorance or incaution, should always be held in view, because when there were no appearance, and if possible, less apprehension of danger, much distress has been unhappily engendered and widely dispersed. The invisible mischief, too, may remain for a length of time without any evidence even of its operation, and afterwards, when least expected, may be evolved and diffused by the concurrence of circumstances favourable to its extrication and propagation. The following quotation from an authentic record, confirms the propriety of some of the foregoing suggestions. "Captain ———, whose gallant conduct on many occasions emblazons the naval annals of this war, lately informed me of an infectious fever having been brought on board La Seine frigate, in her passage to the West Indies, by old canvas. Some men were employed in cutting it up, for the purpose of converting it into something useful, and were, one after another, seized with typhous fever. On carefully inspecting the canvas, it was found soiled with excrementitious matter in different parts, and had a most loathsome smell. It is probable that this canvas had either surrounded sick apartments in the sickly condition of some ship, or perhaps had been spread in the hold for prisoners to lie upon, among whom contagion had prevailed, and in this unpurified state was returned into store at the dock-yard, from whence this frigate was supplied. No caution, therefore, can be too great, so numerous are the vehicles and sources of contagion." This unpleasant possibility constitutes a powerful argument to watchfulness, in those employed in vessels destined for receiving recruits for the navy, when any suspicion arises concerning the propriety of dismissing them with their clothing, &c. to their respective stations or allotments.

LIX. The infection of contagion (for brute matter may be infected, in the strict, true, and literal sense of the name) may lie for some time in a state of concealment, and when opportunity intervenes, will be progressively disentangled and disseminated, and thus be productive of afflictive and calamitous consequences. It seems to be the opinion of some, that only particular infectious complaints are susceptible of diffusion, and capable of producing their peculiar operative influence, in certain states of temperature of the atmosphere. Plague, and what is usually and vulgarly styled yellow fever, &c. are examples; but there are so much nonsensical contrariety, misconception, misstatement, sheer ignorance and gratuitous assumption in reference to these distempers, that the matter may very fairly be deemed as hitherto indeterminate. A difficulty, therefore, seems to attend these conclusions, in the present condition of pathological knowledge, which is not easily to be surmounted. The notion seems to be drawn from this circumstance, that some diseases are never remarkable or predominating in a particular degree of temperature, while on the contrary, they are said to appear and continue when the heat hath assumed a certain elevation. This circumstance, however, does, most probably, not so much confer to the *actual* occasion and *nature* of these complaints themselves, as to the production of the *causes* from which they originate. For this appears a lawful and veritable conclusion, that the *cause* and the *disease* must be constantly and absolutely dissimilar, and have no essentially constitutional homogeneous qualification.

LX. Some infectious diseases seem to be most prevalent, violent and unmanageable, in the colder weather of the northern climates. This would seem to originate from various causes; but a principal reason would seem to be, the confined and impure state of the habitations of the poor, from the artificial closeness, which in these seasons is so carefully maintained for the purpose of warmness. The consequences of this unreasonable confinement, and abominable accumulation of animal effluvia, together with the inquination of excrementitious evacuations unremoved, &c. are frequently troublesome. The distempers thus most ordinarily engendered, are the different degrees and varieties of febrile diseases, which are so frequently assuming such a wonderful diversity of phænomena, from the accidental, but modifying influence of accompanying circumstances. In this manner fevers, and those sometimes of the worst kind, were formerly the disastrous concomitants of navigation. The miserable abodes of poverty and wretchedness, and especially, in populous towns and cities, very commonly demonstrate the bad effects of some of the improprieties lately enumerated. It would be out of place to enter deeply into this subject, and particularly as it has lately been so commonly the object of promiscuous animadversion. These ailments occasionally become less frequent, as the temperate weather advances; and what lately prevailed as an epidemic disease, perhaps, now appears only as a sporadic or vagabond and less frequently observeable complaint. The history of the simple febrile diseases, and which it may be understood, are capable of infecting or not affecting the otherways healthy, but who may have been exposed near the sick, according to a concatenation of circumstances, would declare that they may casually exist in very different degrees of temperature. Some of those violent febrile and infectious diseases, prevail chiefly in considerable augmentation of temperature. Pestilence itself has its seasons of quiescence and prevalence, in conformity to the state of atmospheric temperature, and some other circumstances, but which are not sufficiently comprehended.

LXI. The rudiments of febrile diseases may, in the colder seasons, be embarked in a state of concentration, and afterwards be diffused amongst all who are susceptible of their influence. The contagion of fever has thus been often unknowingly introduced, and the course and cause of the subsequent evolution of the disease altogether overlooked. If it has been conveyed in wearing apparel or bedding, it is probably more dangerous than if it had been carelessly imported in the person of any individual. And principally for this reason, as at the time the appearance of mischief becomes remarkable in any of the people, suitable precaution can be immediately employed, whereas, if the poisonous influence has been transmitted in luggage of any description, it may commence a general operation without the possibility of ascertaining how, or when, the mischief may have been introduced. These observations and distinctions are especially necessary at the first organization of ships' companies, (and when, sometimes, there is least opportunity for deliberation, and strictness or particularity of investigation,) especially if they are mostly constituted of what are called landsmen, or persons lately gathered from different quarters, and who have previously been unaccustomed to this sort of confinement. The influence of contagious exhalations, is strongly and unluckily exemplified in the case of the late Dr. Leyden when at Java, which place has been so deadly to many of mankind. "Leyden, with his usual eagerness, employed every moment of leisure in researches into the literature of the conquered city. Amongst objects calculated to excite and gratify his favourite passion, was a library, said to contain a valuable collection of Oriental MSS. Going out one day with the intention of exploring it, he accidentally went into a large low room in one of the public buildings, which had been the depository of effects belonging to the Dutch government, and was also said to contain some Javanese curiosities. With fatal inadvertence he entered it, without using the precaution of having it aired, although it had been shut up for some time, and the confined air was strongly impregnated with the poisonous quality which has made Batavia the grave of so many Europeans. Upon leaving this place he was suddenly affected with shivering and sickness, the first symptoms of a mortal fever, which he himself attributed to the pestilential air he had been inhaling." This febrific seizure proved fatal to poor Leyden in two or three days, a man who was an uncommon instance of industry and literary capacity: in him, also, was the *amor patriæ* most vigorously manifested.

LXII. The foresaid generally necessary attention to the state of health at the first formation of a ship's crew, should never be disregarded; but, moreover, the operation of preventive measures must be particular and unintermitted; the subsequent introduction of individuals must be under enlightened governance; and there must be a circumspective superintendency over all suspicious communications. The unhappy intrusion of one man fostering or retaining the materies nociva of any complaint, and incautiously admitted to communion with a ship's company, will speedily impart the influence of the specific disorder, first, most probably, to his messmates, and thus the foundation of infectious complaint may be laid in many about the same time, and afterwards the true mode of communication remain questionable. Fever, small-pox, chincough, measles, &c. have thus been propagated either from the land, or by the reception of persons from other ships, capable of imparting these infectious distempers. In this manner, the receiving of prisoners from ships, horrible with filthiness and the consequent production of infectious complaint, hath communicated disease to the sound, and been inductive of much suffering, and sometimes calamitous devastation. The gradual increase of knowledge, the cautious and guarded manner of proceeding among the moderns, have, however, acceptably and considerably diminished the frequency and seriousness of these and such unpleasant occurrences. The history of the British fleet would show the many misfortunes which have originated from inattention to these circumstances. Even in the last warfare, many evils of this description took place, of which the following, among many others which might be cited, is an illustration. "These fevers preserved the character of all other general diseases of this kind; and affected chiefly new-raised men, landsmen, and marines. A typhus was carried on board the Canada, by raw men from the Cambridge, who had been sent from some guard-ship or tender to the eastward, in the Terpsichore frigate, that had been long in commission. These supernumeraries, though badly clothed, dirty, and slovenly, did not appear to labour under actual fever, while in the frigate; but that it lurked in their habits, or filthy slops and beds, is evident, from the whole falling down afterwards, and tainting the ships to which they were distributed."

LXIII. Without a knowledge of the various ways in which poisonous disorders may be transferred and imparted, no scientific plans of procedure can consistently and confidently be adopted, for the exclusion or suppression of these misfortunes. And here again, it is repeated and assuredly mentioned, that if officers, commanders, &c. employ the proper methods for defending their men against the possibility of the introduction of infectious complaints, the practitioner in attendance hath nothing to fear from the exclusive commencement of distempers on shipboard. No diseases which may solely or altogether be engendered on board of ship, should ever be allowed to assume any thing of a formidable appearance. The foregoing hints, on the propriety and usefulness of distinguishing those complaints which are possessed of a disposition to continually diffusing themselves, into those which may be considered as artificially restrainable, or conquerable by instrumental and professional power and management, and into those not susceptible of any modification, or are invincible by any conceiveable applications by way of prophylaxis, will in the course of experience be found serviceable. Each of these comprehensive classifications will be found to have different degrees of intenseness and remission, and be also variously changeable in conformity to the predominance of particular circumstances. For it is well known to all those thoroughly acquainted with their profession, that the diseases belonging to the family of those usually considered as infectious, vary in their occurrence, in their mildness or severity, in the speediness or slowness of their propagation and progression, and in the modification and prevalence of particular symptoms. Even the same kind of disease may be different upon the several occasions of its recurrence, or as affecting different individuals, even during the prevalence of the same epidemic or particular denomination of complaint. Some of such diseases are frequently fluctuating; sometimes apparently moderating upon the occurrence of some particular circumstances, and perhaps afterwards, for reasons altogether inscrutable, and for others, although seemingly remarkable, nevertheless absolutely inexplicable, are occasionally representing the appearance of exasperation.

LXIV. The shutting out, therefore, or exclusion of disorders conveyable or communicable by *contagion, contiguity*, or *contact*, is always eminently adviseable, when this is practicable; for some of those diseases commonly considered as infectious, are by human power irresistible; others only receiveable by the propinquity of the person communicating, to that to whom the malady is communicated. A very different conclusion from this latter is applicable to those infectious distempers, which are customarily transmitted from a distance through the interference of the atmosphere. These maladies can be communicated in a state of invisibility; their commencement is imperceptible; their nature, extremely subtile; the time of immediate and absolute systematic inquination, and also the interval from the time of inoculation until the developement of the distempers characterized, are indeterminable; and finally, the duration of their respective unrevealed agencies, or undisplayed operations, in the different species, is, not improbably, possessed of an unintelligible disproportion. The nearness also, or remoteness of the distance and possibility of their communication is not absolutely ascertainable; and this circumstance must be liable to the governance of laws or principles of operation, which, in the present condition of human science, does not admit of any satisfactory illustration nor explanation. It may here be remarked that, happily for mankind, distance and dilution of the poisonous influence, will, with a few exceptions, generally be effectual in the prevention of all unpleasant consequences. This consideration should afford some consolation to all those who are unavoidably in the vicinage of such diseases as are commonly said to be infectious, that the probability of their exemption is thus evidently and materially augmented. This observation, however, implicates the supposition, that there is no unguarded commeatus subsisting betwixt the distempered and those uninfected. The principal exception to part of the above statement, it will now be immediately understood, is its not correctly applying to those diseases which are irresistibly conveyable by the intervention of the atmosphere. Much will, sometimes, depend on the station of a fleet—for instance, being to windward or leeward of a place where the mischief may be operating.

LXV. The plague itself, which has been one of the natural scourges of mankind for many ages, and which is commonly considered as one of the most infectious and hazardous distempers to which humanity is obnoxious, will be so much diminished in its peculiar virulence, as, even by a moderate distance from its focus of operation, and consequent reduction of its peculiar influence, to become so inefficient as to be comparatively innocuous. As a comfortable and animating reflection to those who may unhappily be in exposure, where this alarming and dangerous disease is prevailing, it may be mentioned, that separation from the influence of promiscuous intercourse will often be sufficient to ensure their immunity. In Africa, &c. when the pestilence visits some of their towns, &c. the merchants and other inhabitants employ only the precaution of shutting themselves up in their houses during the prevalence of the infection, it being contrary to their religion to use any other measures. In this manner, some have escaped the evident operation of this violent and dreadful disorder, merely by the precaution of assuming a moderate distance from its more perceptible places of operation, and the avoidance of intercourse with those who might probably impart the malady. Small-pox, measles, scarlet fever, chincough, influenza, &c. will occasionally be propagated, notwithstanding every possible means, supposed to be beneficial in obviating the progress of infection. Sometimes even the most infectious and spreading diseases, will not be communicated to every one who may come within the sphere of their action; this has been remarked even during the prevalence of the plague, which, as lately hinted, has almost invariably been deemed one of the most violent and most infectious diseases with which mankind are ever assailed. And these occasional exceptions and resisting properties, would seem to depend upon a constitutional particularity, which is altogether inexplicable. The marine practitioner, however, will, in these times of improvement and enlightened management, seldom have occasion to employ his skill in combating any distemper of a formidable description from its infectious properties. As already remarked, any complaints which may be accidentally generated on shipboard, will, very generally, if under judicious guidance, not be sufficient to produce any trepidation. But an observation of a still more decided and forcible nature may here be advanced, and which is, that never any infectious disorder should appear in any ship, in which every circumstance relating to the protection of health is duly regarded, and under the influence of suitable management. The importation or embarcation of disease through carelessness, is a consideration of a different complexion; and also, where there is time for deliberation, it is, strictly speaking, commonly inexcuseable. Cleanliness, both as corporeally and circumstantially applicable, ventilation, separation, and skilful medical treatment, will generally prevent or speedily subdue any ill consequences.

LXVI. Some remarks have already been made on the propriety, or rather necessity of completely ascertaining the health of men intended for the navy, &c. previously to their embarcation. Inattention to this, which hath frequently happened in the hurried mode of manning these vessels upon emergent occasions, is followed by manifold disadvantages. This is a critical stage in the progress of fulfilling these purposes. A slight oversight or mistake at this period, when the greatest circumspection and strictness of management are so unequivocally commendable, may introduce distempers of a spreading disposition, and thus be an unhappy drawback upon the physical strength of a ship's crew when most required. This prudential foresight, and the regulations thereupon instituted, will not only be applicable where landsmen may be received, whose natural history and respective circumstances are, perhaps, nearly or altogether unknown; but likeways, where levies or recruits are got from other ships, and particularly when it is understood that in them there hath been prevailing sickness. At all times it is most unfortunate and discouraging, to receive infected men, when, perhaps, ships are preparing with the greatest urgency to proceed against the enemy. A commander in such circumstances must have some hesitation concerning the true state of his ship's company, and at this critical moment, by an unexpected reduction of his actual moving powers, may have to lament the arduousness of conquest, or the uneasiness accompanying disappointment. These animadversions are of such high moment, and so easily comprehended by every person who is the least interested in the naval service, and the defence of their native country, as not to demand, in this place, any additional illustration.

LXVII. And now some compendious instructions on the cleansing of persons suspected, and also of their clothing, bedding, bedclothes, &c. may here be subjoined. From the increased attention which has lately been bestowed upon the comfort and health of the seafaring, but especially of those belonging to the Navy, much discussion must be considered unnecessary. A consideration of the first importance, is the appointment of suitable contrivances or apartments, for the reception of those suspected to be under the influence of infectious disorders. And this will be both adviseable and necessary, whether the people be actually and personally under the dominion of infection, however obscurely this may be discoverable, or even when from their unhealthy appearance, they may be supposed to harbour any of the materies of infectious contagion. This temporary confinement (not the unpleasant confinement of incarceration is here understood) should be made as tolerable and pleasant as possible. The apartments appropriated to these purposes should be rather spacious than confined, and conveniently susceptible of sufficient but regulated ventilation; and the management of this part of the business must be in some measure determinable conformably to the season of the year, and also to the peculiar state of the weather. The contrivances which have been adopted for the reception of men destined to the naval service, have commonly been very incommodious, and more like gloomy places of imprisonment than calculated for the designs aforementioned. Receiving ships, as they are styled, are commonly employed for their temporary lodgement. These should always be large vessels; and it is almost needless to suggest the absolute necessity of the highest degree of cleanness. The undue crowding of these vessels, which is an impropriety of too frequent occurrence, and is sometimes productive of the most unpleasant consequences, is particularly objectionable. An additional inconvenience accompanied with its disadvantages, is the impossibility of keeping a receiving ship, when thus overstocked, in a state of sufficient cleanness. And, moreover, a consideration of magnificent importance, and which is judged to be a dissuasive against the practice of crowding, is the chance of any diffusive complaint displaying itself, by which, also, the readiness of its subduction would be materially diminished, and, what is still more important, the excitement of contagious complaints may thus be endangered.

LXVIII. The accounts of what are called prison-ships, hulks, &c. and all the other infernal machines for similar purposes, are truly dreadful, and lamentable: these abominable receptacles have been the source of the greatest mischief. Such contrivances in their present condition are direful abodes, and although intended for an unfortunate and a flagitious part of mankind, yet, their forbidding semblance and disgraceful appearance, must be perpetually offensive to the eye of philanthropy. These noisome and horrible receptacles of misery and distress, are certainly susceptible of improvement. Iniquity, it is true, should always regularly receive adequate chastisement; but, surely, the confinement of these unhappy and misguided creatures, might be accomplished in a mode not so prejudicial to the public health and manners, not so opprobrious to the human character, nor so disreputeable to the honourable principles of liberality; and might also be conducted with discernment, and a commendable disposition to forgiveness, and the mitigation of misfortune. How often have naval officers and surgeons had reason to complain of the mischiefs which have been so frequently deriveable from these fertile springs of filthiness, despondency, discouragement, and pestilence! The prevention of these ills will be instantly obtainable, by an assignment of more convenient and commodious apartments for retaining these people, until their condition of health is satisfactorily determined, and the time of their distribution for employment.

LXIX. This is not a theoretical conclusion, but it is confirmed by the extensive observation of some long acquainted with the state of the medical department of the Navy, that much mischief hath originated in the first collecting and confining of the men for naval service. "On the subject of receiving men from the out-ports, whether seamen or landsmen, I have formerly offered my animadversions. Representations, remonstrances, expostulations, have repeatedly followed one another, but followed in vain; the same routine of cruelty, ignorance, and sloth is permitted; and a future war may be begun before a single step is taken to correct measures, that above all others, are the most prolific source of disease; but particularly to ships newly fitted, when men of every different description are all at once mixed together, strangers to their officers, and strangers to one another. Newly raised men, whether voluntary or impressed, at the respective ports where they are enrolled, by what is called a regulating officer, a Captain or Lieutenant, are confined in tenders or other vessels, till a sufficient number is procured to fill the complement, when they are sent by sea to a King's port. The tenders are fitted with *press-rooms* for security, which are literally prisons, where air, so necessary to animal life, is almost excluded. His Majesty's ships having marine sentinels, can have no necessity for these closely built apartments.—From the out-ports, tenders have come with new-raised men to man our ships, where I have known such abuses, as well on health as on other matters, as surpass all belief. I have known a guard-ship having for months together near two thousand men on board;—a grave to health, as well as to order and discipline!—In short, the medical arrangements seem still in infancy.—Draughts of raw landsmen are frequently sent from the guard-ships to fill the deficiences of complement; and we can often, without doubt, mark the first movement of infection; and as this so frequently occurs, there is much room left for the suspicion, that in nineteen out of twenty instances of general fever, in ships, they ought to be traced to this origin.

LXX. " If it is intended, in raising men for the navy, that they are to be collected at the out-ports, till they amount to a given number, it is but justice to the men, as well as to His Majesty's service, that they should be lodged in apartments that are conducive to health. Not in filthy and confined small vessels, like the tenders at present in use, but in King's ships, commanded by naval officers, and worked" (wrought) " by men belonging to the navy. There, from their first entry, they can be best taught that order, discipline, and regularity of duty, which they are afterwards to follow on a larger scale. Spacious ships, like those now employed for troops, ought also to be appointed for carrying them to the naval ports. But the first business in the recruiting service ought to be, to clean and clothe the raw landsman, to learn him how to keep his person decent, and how to preserve his clothes and bedding from being lost or stolen. To these ought to be added, the appointment of a steady old seaman, to instruct him in the first rudiments of manual seamanship, that his improvement and usefulness may be progressive.—The tenders on the present establishment are in every respect obnoxious. They are deficient in medical assistance, though no part of service more needs the presence of a well-informed surgeon; and the only naval officer on board is the Lieutenant commanding. The vessels themselves are the property of rich merchants, who make them a traffic; and they are navigated by a master and crew, who usually belong to the ports to which the vessel comes to, and who have other attachments on the spot than public service. On the whole, I consider tenders as a great nuisance, and earnestly wish to see them banished from naval employment." In the marine and naval service, this must be a subject of great interest. Much collateral evidence might be adduced, of infection being thus engendered, and then unluckily propagated; but the subject must be so readily comprehended, that additional illustration would seem to be unnecessary.

LXXI. At the beginning of warlike preparations, by the adoption of these necessary precautions, when practicable, one source of serious and spreading evil may thus be, commonly and happily, rescinded. When there is no immediate and urgent need for supplies, these processes can be conducted with more deliberation, and consequently, the state of health as really subsisting, be completely ascertained. As soon, therefore, as some men are gathered for the use of the navy, they should, when there is, as already observed, any cause for suspicion, be transferred to convenient places of reception, for the purpose of fully and fairly determining the precise condition of health. The spaciousness and cleanness of the apartments intended for their accommodation, continuing these critical inquiries and probationary operations of conservative investigation, will then be considerations of unspeakable consequence. When the men are thus placed, they are supposed to be under the guidance and regulating ministration of persons, who are sufficiently acquainted with human nature in its amazingly diversified aspects, relations, and qualities; and, moreover, as essentially necessary, with the distinguishing and the ascertaining of the presence of tolerable health from the existence of disease, however slightly this last may be remarkable. Without this requisite assistance and distinctive management, many other considerations must be deemed unavailing. A watchful superintendence must, therefore, be constantly and distinctly maintained over the men, for the detection of any particular complaint. Occasional variation of practice will, likeways, be necessary in different degrees of existing mischief, or in conformity to incidental modifications. At the beginning of the evolution of febrile affection, for example, the individuals who appear to be infected should be instantly separated from those who are hitherto seemingly in the enjoyment of a moderate proportion of healthiness.

LXXII. Ablution in warm water, with the aid of soap, will be highly useful, and the operation should be thoroughly performed: the water at the temperature of 80° or 85° will in general be sufficient;

but the season of the year, and some other circumstances, must determine its mode of application, and degree of temperature. This salutary operation is not proposed merely for those who may be indisposed, but as the men are commonly procured in a state of filth and rags, the operation of cleansing becomes adviseable and necessary to all without exception. For the performance of these needful purposes, machines, calculated for bathing or ablution, should always be connected with the provisional receptacles. Bathing machines have been already commended at sea-port towns, or at those places where there is a common resort of the Navy in particular. Every part of the surface must be properly cleansed, by rubbing with brushes or hard towels, &c. The common sponge will be found occasionally very convenient, and where any tenderness of the surface forbids a rougher article, it is an agreeable substance for these applications. The sponge should be carefully washed after each repetition, and thus there will be less chance of its containing any thing offensive. This purifying should be repeated about three times every week, or oftener when judged necessary, varying the warmth of the water in proportion to the state of the person's feelings, or the several views intended. The squalid coating of dirtiness being removed, the person will then, if not under the pressure of a severe degree of disease, present a very different aspect; and the visage, which lately exhibited the symptoms of uneasiness and despair, will now brighten with the appearance of liveliness and confidence. The loathsome foulness which hath constantly proceeded from slovenly habits, perversely and injuriously encouraged, and which hath been formed by progressive accumulation, once removed, he must also be indulged with raiment, &c. in a state of sufficient cleanness. But so much hath already been delivered upon this latter subject, that no further remarks seem necessary.

LXXIII. The odious rags, if of no value, or useless, should be forthwith destroyed, but if of better quality, and might afterwards be serviceable, a purification of them may be all that is sufficient. The wearing apparel which may have been employed by the infected, or even exposed in situations where contagion may have operated, should always be considered as suspicious. All those articles, therefore, containing a poisonous property, or which are supposed capable of conveying, or of being the means of imparting mischief to those exposed to their influence, should be immersed in cold water, and remain until they are submitted to the operation of boiling, washing, scouring, &c. and which processes, in general, should be immediately performed. With the intention of obtaining a more complete abstersion, a little pure soda, but recently and properly diluted, excepting, where it destroys the colours, will be found extremely powerful. All articles, whose colour belong to white, may, therefore, undergo this mode of cleansing. For the expurgation of all doubtful substances, or where they are supposed to be extensively and virulently contaminated with the morbific miasmata of distempers, the application of the hyper-oxymuriatic acid, properly reduced, may sometimes be commendable. But in all ordinary degrees of morbific impurity, plans of a less forcible nature will be perfectly sufficient. During the drying of such garments, their free exposure to the atmosphere, and especially when this is briskly agitated, should not be neglected. It is well known, that the poisonous influence of most infectious diseases, even of the plague itself, if this disorder be actually contagious or infectious, nam adhuc sub judice lis est! is either decomposed and thus rendered apparently harmless, or dissipated in a pretty high temperature. On this account stoves, &c. have been proposed for the purpose of heating articles of clothing, which are considered as imbued with the poisonous influence of infectious complaints, and thus disengaging the mischievous matter, or at least rendering it ineffectual. The addition of a moderate degree of heat during the drying of such clothes, may be adviseable, and hence the advantages of the summer-heat of this country for such purposes; and the powerful influence of that of the tropical and other warm latitudes.

LXXIV. The immediate removal of all corporeal defilement, therefore, should never be neglected, and also of all suspected articles of dress or bedding, &c. and the absolute destruction of some offensive and dangerous substances, can never be justly compared with the advantages which upon these occasions are the subjects of intention. These or such like measures being carefully fulfilled, the tendency or disposition to febrile ailments will frequently, or rather, commonly be overcome, and the subsequent formation of disease prevented. This seasonable interference and decisive conduct will not only obviate incipient disease, but be the means of preserving health, by opposing the progression and diffusion of assimilating distempers. As it is presumed that those men who are thus hurriedly collected for public service, are seldom provided with bedding, &c. instructions for cleansing these articles are apparently in this place almost superfluous. The articles of bedding are often the most dangerous of all their appertinents. By long use, and inattention to their cleanness, they become charged with much filth; and if they have been lain upon by those labouring under infectious diseases, they may readily retain, and even for a great length of time, the power of imparting mischief to those who may afterwards be subjected within the sphere of their operation. Mischief has been thus frequently carried on shipboard, and the source of the evil perhaps continued undiscovered. The bedding or bedclothes may thus contain the seeds of disease, while, perhaps, the people themselves are free of any mischievous impregnation. It is not impossible, that, in this manner, the same person or persons may be twice infected by the same general stock of infection. The necessary attention should, therefore, be always paid to the clothing and bedding, for even although the former should be duly purified, and the latter allowed to continue in a state of contamination, it will most probably, at one time or other, be the source of bad consequences. The propriety of the advice given on the article matresses, will now be perceptible. The painting of them, so as to exclude any mischievous inquination, is highly adviseable, and especially in those instances where people are confined with fevers and other infectious complaints.

LXXV. Continuing these probationary proceedings, it is necessary that due attention be continually and distinctly transferred to the management of individuals respectively. Outward appearances must be carefully observed, and every departure or deviation from the naturally customary indications of health, should be instantly regarded. The state of the bowels should be properly considered, and also that of the pulse and tongue. But some important remarks were made upon some of the appearances or signs of health and disease, in the Introduction, so that there is now less occasion for amplification. If after these cleansing processes, continued for a fortnight, or at the most three weeks, the people should remain free from all the phænomena of any particular complaint, if all the other specified precautions have been knowingly employed, they may safely be adjudged, with respect to disease, to be in a state of innocency. About the fourteenth or sixteenth day, if all the forementioned particulars have been correctly and rigidly observed, and suspected substances withdrawn, or those which will admit of the requisite depuration having passed through this expurgation, the men can now be declared fit for general service with some confidence. The conclusive determination of a question of such weighty moment, will more peculiarly depend upon competent information with reference to every circumstance, and a satisfactory intelligence of all the acceptable appearances of health, should be taken into a determinate calculation. A sufficiency of intestinal and digestive regularity and correctness of performance, a clean tongue, a sound lively eye, an agreeable clearness of complexion, and the presence of what may appear to be the natural plight of the body, and other expressive characteristic phænomena which are the inseparable companions of health, with others, will all aid in modifying and assisting the decision of the determinative superintendent.

LXXVI. Having proposed these short notes on the propriety and usefulness of the timely detection of the characters or phænomena of complaints, and also of the suitableness and profitableness of precluding, by a scientifical circumspection, the chance of introducing infectious diseases, some abbreviated reflections upon the following subjects may now be subjoined. Only a few explicative considerations upon conveyable complaints, with a discrimination of them into classifications, conformably to the phænomena which they customarily represent, and their mode of communication, are here admissible.—A lengthened examination of these circumstances would unavoidably lead into a minuteness of disquisition concerning the natural history of such distempers, their ordinary mode of impetus, their respective and particular characters, their occasional disappearance and revivification, their almost indeterminable modifications, and those laws or ordinances by which they would seem to be regulated in their revolutions, &c. as would be inconsistent in a work of this nature, where such subjects constitute no immediate part of investigation. From the remotest times, of which any rude accounts have been preserved and transmitted, it would seem, that diseases of an infectious property have continually been the causes of alarm and distress to mankind. This is abundantly confirmed both by the testimony of profane and sacred history, from the pestilence of Moses to the plague of Athens, as recorded by Thucydides. These devastating morbific calamities are described as not only affecting the human race, but also cattle or others of the brute kind did not escape the deadly operation: "Behold, the hand of the Lord is upon thy cattle which *is* in the field, upon the horses, upon the asses, upon the camels, upon the oxen, and upon the sheep:—a very grievous murrain. For now I will stretch out mine hand, that I may smite thee and thy people, with pestilence; and thou shalt be cut off from the earth." The original word דבר is applied to plague, or pestilence, and seems to have been extended to epidemical and pestilential complaints, as emphatically comprehending those diseases which carry or drive men off. This must, therefore, refer to the hastiness of operation and violence of effect of such irresistible distempers.

LXXVII. The devastations committed by such disorders amongst their armies, and in their besieged places, have been occurrences productive of lamentation and disappointment from time immemorial. The description of such afflictions constituted business to the historian, and foundation to poetical exaggeration and embellishment. These calamitous events were in those days, and indeed still may justly be deemed, visitations of a direful nature, and inflicted by a divine permission, and intended for the castigation of humankind. Some of the most formidable and destructive complaints originated and were propagated in the congregated conditions of mankind, and, from thenceforth, became still more extensively disseminated. They sometimes acquired strength in progression, and additional vehemence at points of accumulation; and were more feared than the weapons of their enemies. From the supposition of their divine causation, diversified incantations and atonements became the order of the day, and the appeasing of their Divinities who were supposed to be displeased with their iniquities, constituted their highest desideratum. Pestilence is frequently mentioned in the Scriptures as one of those dreadful visitations, and was always considered as under the governance of a celestial ministration. Ovid has given the following affecting description of pestis, or pestilence.

> "Viscera torrentur primò, flammæque latentis
> Indicium rubor est, et ductus anhelitus ægrè.
> Aspera lingua tumet, trepidisque arentia venis
> Ora patent, auræque graves captantur hiatu.
> Non stratum, non ulla pati velamina possunt:
> Tantaque sunt miseris invisi tædia lecti,
> Prosiliunt, aut, si prohibent consistere vires,
> Corpora devolvunt in humum, fugiuntque penates
> Quisque suos, sua cuique domus funesta videtur.
> Aspiceres flentes alios, terrâque jacentes,
> Lassaque versantes supremo lumina motu;
> Membraque pendentis tendunt ad sidera cœli,
> Hic, illic, ubi mors deprenderat, exhalantes."

The comfortable reflection is, that in the northern latitudes little is to be feared from this distemper. This is a consideration of the highest moment in the naval and commercial proceedings of the country, for they are entirely safe, in all situations, at a moderate distance from the sources and ascertained operation of pestilence. In the Mediterranean Sea, the greatest precaution will be necessary, for on the coasts of that sea, plague is occasionally prevalent.

LXXVIII. The nature and fountain of most, if not of all the infectious complaints, remain veiled in difficultly scrutable obscuration, or rather they lie hid in impenetrable concealment. And whether there be an approaching shade of similitude of disposition in the essence of all these, or whether there be an absolute difference, is not understood, but the last supposition is the most probable. It appears, indeed, the most reasonable conclusion, and at least, theoretically, most conformable to the ordinary course of natural proceeding. That the generating efficiency of the different infectious distempers, is particular, or separately distinctive, as applicable to them respectively, and in possession of characteristic qualifications, is the most philosophic and congruous determination. The difference of phænomena which the several infectious diseases present, likeways, goes far in deciding that there must be a radical difference in their causation. It is not known that Nature, although seemingly operating upon the simplest but most efficient principles, by one chief cause ever produces such diversity of morbid phænomena. At the commencement of small-pox, and the apparently congenerous disease, measles, there is often an approaching similitude in many of the phænomena, and particularly, in the appearance of the cutaneous eruption, yet, when the two complaints are critically examined, an essential difference is discoverable. Betwixt the last mentioned disease and scarlatina, there is commonly still less discrepancy in the perceptible circumstances, but every intelligent practitioner knows, that betwixt these two diseases, also, there is an important difference. The illustrative discussion of this subject would be too extensive for this part of the work, and must therefore be reserved to some subsequent opportunity. The calamitous consequences and devastations caused by complaints occasionally engendered amongst the ancients, but more especially in their armies, were of a febrile description, commonly resulting from their unnatural closeness or aggregation, and confinement, their imperfect and improper alimentary supplies, dirtiness, despondency, and multifarious other circumstances. All these evils, however, were experienced chiefly on land: only, it is mentioned of the army of Elius Gallus, while in Arabia, or more strictly, in the Arabian or Elanitick Gulph, &c. as follows: "But fifteen days were required to extricate the fleet from the sea of Suez, and to reach the road of Leukè Komè; and here, when they arrived, many vessels had been lost, and the troops were so afflicted with a disorder in the mouth, and swelling in the legs, that the remainder of the year was lost, and the expedition delayed till the following spring." Hitherto, navigation had not extended her wings, so as to cause those diseases which afterwards accompanied this unpleasant mode of life in her progressive dissemination.

LXXIX. A lengthened prosecution of this subject seems to be now unnecessary, and more particularly since the valuable alterations and amendments effectuated in the management of the general method of preserving health, or, which is the same thing differently expressed, of the *Prevention of Disease*, in the improved state of navigation. This commendable display of humane disposition and conservative endeavour, hath principally manifested itself in the British Navy; but this, after a long and injurious darkness of obstinate ignorance, and pertinacious adherence to the ways and forms of predecessors. The spirit of liberality and enlightened patriotism hath, it may be remarked, shone both with more liveliness and usefulness, and the consequences have been the improvement of imperfection, and the chastisement of impropriety. From these acceptable and beneficial meliorations, too, the mass of disease and the severity of human suffering have been considerably diminished, and consequently, the necessity of the laborious opposition to spreading distempers hath also undergone a proportional diminution. Of all the diseases which have assailed British sailors, and, especially, in foreign climates, the disease vaguely called the yellow fever, has, perhaps, been the most destructive. But fortunately, however, this complaint chiefly affects them in the warmer climates. The natural history of this complaint, with many circumstances in reference to it, is far from being properly understood. Dysentery is another distemper of singular importance amongst the seafaring, and more particularly as it is an affection which hath been grievously mismanaged, and been too often the subject of empirical administration. More correct views have been lately entertained concerning this complaint, and the plan of management is become more appropriate. While these and other violent diseases are peculiarly troublesome in tropical climates, the other regions of the earth are not without their inconveniences: but this is not the time and place to enlarge upon such subjects, however important in themselves; and although bewildered with much obscurity, and attended with many difficulties, yet they certainly form an interesting thesis to the intelligent and experienced.

LXXX. In ships under the government of enlightened and distinctive discipline, and under the full influences of ordinations, regulations, and having supplies, such as have been antecedently enumerated, and specifically, although compendiously investigated, there should never be the appearance of any complaints, but such as arise from causes which are general in their operations, and, therefore, absolutely unavoidable. Catarrh, Pertussis, Rubeola, Cynanche, Pneumonia, Rheumatism, Dysentery, Phthisis, and in some regions of the world yellow Fever, which has been the scourge and destroyer of so many of mankind, and several others, may be considered as of this description. These are distempers which may appear and some of them become diffusive at particular seasons, notwithstanding all human efforts to oppose their introduction and appearance, or to arrest their propagation. Some of these, the Epanetus malignus of Mr. Good, for instance, are generally mischievous only in the warmer regions of the earth, where they may for the time be prevalent: others, on the contrary, as depending upon circumstances which are more commonly operative, (at least this may be assumed as a fact in the present condition of human science,) may occur in any climate whensoever, the causes requisite to their exquisite and successful production, predominate. The Catarrhus contagiosus, or as it is more commonly known under the barbarous appellation of influenza, would seem to be extensively diffusible in the atmosphere, (for aught that is at present known to the contrary,) originating from some particularity of atmospherical circumstances, and irresistibly communicable to all who are susceptible of its specifical impression. All these diseases, however, are considerably modifiable in their phænomena, in conformity to a concourse of things which are perpetually fluctuating, in a manner which no human knowledge can comprehend; but this observation remains unaffected, that they, likeways, take on a remarkable discrepancy in some of their phænomena, in consequence of the plan of treatment, and of other circumstances, almost innumerable.

LXXXI. The discrepancy of opinions which hath continually prevailed concerning all these disorders, hath also been a principal cause of the perplexity and darkness in which the knowledge of them hath been perpetually implicated. Even the terms contagion and infection, as applicable to the distempers in contemplation, have hardly, or rather have never certainly, been philologically and philosophically discriminated. This want of distinctness, this perplexing use of appellations which have been allowed to continue in a state of ambiguity or vagueness, have for a length of time unhappily marred not only the natural history of diseases understood under these terms, but what is of indefeasible consequence, have materially and hurtfully influenced their treatment. The two terms are neither synonymous nor equipollent appellations; nevertheless, what may appear contradictory, either of them may be consistently and grammatically appropriated to the same disorder in different degrees of advancement. These two very commonly employed terms, have by many been most preposterously deemed synonymically significative, but which proposition seems to be both inapplicable and ungrammatical. Others have ignorantly attempted to establish a difference of meaning, but have afterwards, almost invariably, confounded their imperfectly ascertained distinction, and blunderingly overlooked the strictness and legitimacy of their appropriate and philological application. As lately hinted, the two terms may be applied to different states or stages of the same disease. This assertion may to some, who have more presumption than knowledge, appear paradoxical, but the subsequent observations will probably confirm its authenticity. The immediate application of any poisonous disorder to the surface, is *contagion;* and afterwards, if the same distemper is susceptible of being systematically disseminated, or capable of pervading the general structure, whether substantially or influentially, it may then be said to be operating in the character of *infection.* The first appellative may express the beginning of the mischief, and the latter its systematic diffusion and perfection.

LXXXII. At present it would be somewhat incongruous with the nature of this subject, to enter into an elaborate disquisition concerning the discrimination and other circumstances of contagion and infection, as the discussion necessarily presupposes an inadmissible extensiveness. These terms are commonly, but most improperly, considered in their signification and employment to be equipollent. It is observeable that, in the primitive and absolute meaning of these words, they cannot with any justness be considered as even synonymous, or apparently comporting a similitude of interpretation; but in their importance comprehending a constitutional and constructive dissimilarity; the developement of which would need philosophical discrimination. This has formed the principal difficulty in the management and syntactical application of those terms, which are commonly deemed synonymous, in all languages. The two words in question are signs employed, in strictness of language, as always expressive of different conceptions. They are in their primordial constitution, as dissimilar as Facere and Tangere; and when they are combined with their respective and intensive particles, they acquire an augmentation of significancy, proportionate to the congregated intenseness caused by these syllabical adjunctives. Nor does it appear to be necessary to endeavour to illustrate, how the miasmata morbifica may be contained and conveyed in wearing apparel, bedding, &c. and thus, without any evidence or suspicion of their concealed existence, be imparted to the previously unaffected. An observation of great importance may also be made, how that those carrying the materies contagii may, on common inspection, show no symptoms of distempered constitution, but, yet, communicate the influence of the evil to their comrades and messmates, or to others with whom they may occasionally be conversant. Persons who have recovered from illnesses of an assimilating disposition, and who, perchance, at the time exhibit the ordinary appearance of moderate health, may, thus be introductive of infectious complaints, and yet the origo mali continue to be inscrutable. Febrile infecting property may, in this way be unhappily transferred, and imperceptibly communicated.

LXXXIII. The philological explanation of the terms contagion and infection, which have too often been confounded, will remove some apparent difficulties, correct some literal mistakes, and open a door for some supervenient investigation. All diseases capable of imparting their specifical influence through the medium of the common surface, at whatever point of contiguity or contact, even the hollows of the pulmonary structure, for instance, and of afterwards displaying their respectively characteristic phænomena, may be styled contagious. The same complaints when constitutionally disseminated, are in the state of infection. The person upon whose surface the materies of a diffusive distemper is lodged, is thus exposed literally and physically to *contagion*, or the influence of contact, without any needfully implicated reference to future occurrences, or morbifical contamination. The individual, however, after the disease is absorbed or transferred into the circulation, is, actually and physically considered, infected. The distemper in the state of immediate application, and before, or previously to systematical inquination, is physiologically and philologically speaking, *contagion*; the same in progressive propagation and influential consummation, is *infection* absolutely predominating. These are the accurate and allowable distinctions of the terms, and which every practitioner, who has learned his grammar and his profession, will immediately comprehend. From these short notes it would appear that, the same complaint may receive either of the two forementioned appellations, conformably to its exact condition at the time, and especially to that of its advancement. The distinction seems to be of importance, but here it must be remarked, that the same complaint on the other hand, may be contagious, but not infectious; that is, be capable of pervading and affecting the whole body: several diseases affecting the surface may, perhaps, exemplify this conclusion.

LXXXIV. The classically authenticated application of these two words, will completely elucidate the ideas or notions which should be attached to them in philological appropriation. As hath been the fate of many terms in most languages, these two have, likeways, been transmuted from their primitive adaptation to material subjects, and occasionally been made expressive of modifications of intellectual qualification. Two words, varied by difference of termination, have been employed to express morbific influence upon the surface; and these are, contagium et contagio; the first is most common in poetical, the latter in prosaic composition. They were principally applied to those distempers which were considered as communicable by approximation.

> "Non mala vicini pecoris *contagia* lædant."
>
> ——————————" priusquam
> Dira per incautum serpant *contagia* vulgus."
>
> ——————————" *contactûque* omnia fœdant
> Immundô."
>
> " *Contagio* ipsa vulgabat morbos.——Post ubi, *contagio* quasi pestilentia invasit."
>
> " Nulla nocent pecori *contagia,* nullius astri
> Gregem æstuosa torret impotentia."

In these examples, the term in the Poets always occurs in the neuter gender, and is applied to diseases as passing from the surface of one animal to that of another, but it does not of necessity include the systematic dispersion of any complaint. If constitutional contamination is presupposed, then the word *infection* is regularly and legitimately applicable. This, then, would seem to be the primary and immediate state of any disease or evil, when it is simply applied to the surface; but this is not so consistently and perpetually maintained as always to be strictly observed. The general term seems to be occasionally indicative of the same mischief in its most diffusive influence; but this does not subvert the general notion, that the appellation was more rigidly and naturally applied to diseases chiefly affecting, in the first instance, by superficial contamination.

LXXXV. The meaning of infection, an abstract noun from the verb inficere, and retaining verbal virtue from the participle passive "infectus," may be collected from such quotations as the following.

————" quo non præsentius ullum
(Pocula siquando sævæ *infecere* novercæ,
Miscueruntque herbas, et non innoxia verba)
Auxilium venit, ac membris agit atra venena."

——" hoc fuscum labris splendentibus amnem
Infecit, occultè medicans."

" Et genus omne neci pecudum dedit, omne ferarum,
Corrupitque làcus, *infecit* pabula tabo."

————" Aliæ panduntur inanes
Suspensæ ad ventos: aliis sub gurgite vasto
Infectum eluitur scelus, aut exuritur igni."

The term infection was thus correctly employed where there was an universal and a complete alteration effectuated in the substance, whether animate or lifeless, upon which the poisonous energy may have produced its peculiar influence. The word also signified the mingling of colours—the process of dyeing, or staining—and Pliny hath used the following expression, but rather impurely, and not partaking of classical elegance; "mulieribus palpebræ infectæ." He here alludes to the custom of females colouring their eyebrows. And he, likeways, says, "infecti sole populi." But his is not sufficient authority to establish these as an unexceptionable appropriation of this term, as being only expressive of superficial application. Seneca seems to have had a very correct notion of its metaphorical signification: "Vitia elici difficile est, non enim inquinati sumus sed *infecti*." From this it would evidently appear, that this last participle, from which the abstract noun, as already observed, is a derivative, is not immediately indicative of superficial defilement, but of something operating generally, and modifying the whole mass with contamination.

LXXXVI. It would be rather foreign to the spirit and general design of this undertaking, to enter into a laboured attempt at classification and nosological arrangement. This is a subject upon which much hath been said and written, and still the knowledge and methods continue very unsatisfactory. Different forms of arrangement of the multifarious distempers to which humanity is heir, might be adopted; they might all be divided into two grand classes, namely, into those of a general and those of a topical nature. These two forms, however, although they would comprehend all the ills affecting the human frame, would be very difficultly distinguished, and unexceptionably reduced into their respectively applicable classification. For instance, a complaint at its beginning may be of a topical nature, but in its progress, it may become of a constitutional description.—Or, the indispositions of the human constitution may be subdivided into those complaints, which, conformably to the peculiarities of some concomitant and specifical phænomena, might be distributed into three grand classes. And the first of these, is that tribe of diseases which are intransitive, or not communicable, and, therefore, neither infectious nor contagious. The second class can be communicated through the intervention of the atmosphere exclusively; but the legitimate correctness of this subdivision seems doubtful. And the third class, comprehending those disorders which may be caught by contiguity, immediate apposition and inoculation. But if minuteness of discrimination be at any time advantageous, a fourth class, or heterogeneous, may, moreover, be constituted, comprising those diseases which are communicable by the atmosphere, and also by superficial application or inoculation. Under these fourfold classifications, accordingly, all the maladies to which humanity is obnoxious, might, as far as relates to nosological arrangement, be regularly comprehended. The calculation of the particular distempers which may naturally fall under any one of these classifications, and also of those which may come under the promiscuous subdivision, or those which are communicable by aerial conveyance, or by contagion, that is, material, palpable, superficial contact, would to the particular investigator, be considerably advantageous. These are considerations of great moment, both to public medical officers and to the services in which they are engaged; and there is here much ground for inquiry, but for different reasons, there is now no intention of enumerating and investigating the various diseases which are to be implied in the forementioned respective subdivisions. Any tyro in medicine knows, that the small-pox have been imparted by contact and inoculation, and that the same disorder has also, times innumerable, been communicated to the previously uninfected, by simply entering an apartment where the morbi materies is actively existing. All these observations have been made, and suggestions proposed, for the sake of those occupied in marine practice, and where it is so remarkably beneficial, either to exclude or mitigate and exterminate, as far as practicable, all diseases of a communicable description, as soon as they are sufficiently distinguished.

LXXXVII. It hath been formerly and repeatedly said, that no complaint accidentally or contingently engendered on shipboard can ever prove very distressing or calamitous, but through the most culpable ignorance or clumsy mismanagement. And a knowledge of those complaints which are communicable through the atmosphere and by approximation, will enable both commanders and practitioners to regulate the exposure of the men, when in or near places where mischievous and diffusive distempers may be prevailing. Disregard or ignorance of this circumstance, in harbours and at maritime towns, hath frequently been accompanied with inconvenience, or followed by unpleasant and incommoding consequences. An individual who is himself, perhaps, not immediately susceptible of a particular complaint, may, nevertheless, be the impoisoned fountain and dispenser of the evil to others, and thus unknowingly a violent disease may be propagated to all who are not capable of withstanding its peculiar and pervading operation. This unfortunate occurrence is particularly disagreeable, when a commander is, perhaps, determining to proceed against the enemy, and when thus he cannot form an accurate or even a probable estimation of his effective capability. In the space of a few days, by the unexpected quickness of the distemper's progression, the amount of strength may be greatly impaired, whereby his views may be unhappily disappointed. This misfortune, too, may happen at a time peculiarly favourable to the spread of infectious disorders, and especially amongst ships' companies, which have been recently assembled, and labouring under some share of diffidence and depression; and also in some measure, or altogether unaccustomed to the impetus of marine hostile engagements. But it may be observed, that it is not always from diseases which are strictly of an infectious or a contagious nature, that seamen may be disabled. They are frequently disqualified by diseases originating from the operation of circumstances of a general influence, and scurvy is one of these distempers.

LXXXVIII. A comfortable reflection, however, to all those concerned and interested in those proceedings, is, that if a ship's crew hath remained healthy for a fortnight or three weeks after its first institution, and continue to maintain all the ordinary signs of unimpaired healthiness, there is the evidence of a strong probability that all is safe; and that there is no particular risk of the subsequent evolution of complaint. This enunciation, however, it must be understood, is necessarily attempered with this supposition, that correctness and good management have been regulating principles in all the preparative departments. The probability, or rather absolute certainty, that no concealed mischief had existed previously to embarcation, and that no suspicious articles or persons have been carelessly or inadvertently passed unobserved, is here also impliedly understood; otherways, what is now latent disease, may afterwards burst into view at a time seasonable to its developement, and spread by the aid of those circumstances which are favourable to its successful propagation. The avoidance of the introduction of disease, as hath already been more than once suggested, is another expression for the preservation of health, and constitutes a piece of precautionary management, which, in the means adapted to the general prophylaxis, is never to be disregarded. A knowledge of the most prevailing disorders, of their nature, and to which class of nosological arrangement they may naturally belong, will aid the intentions and direct the decisions of the practitioner. For many of the diseases commonly considered as infectious, may be happily prevented by appropriate management; but it must be known that some diseases, again, belonging to the same head of classification, cannot so easily be obviated in their progression. Some diseases, the influenza, for instance, cannot be prevented by any human power, but they run a course and operate in a manner, which in the present condition of human knowledge are altogether unsearchable.

LXXXIX. All the reasonable precautions at the commencement of these undertakings being thus carefully and suitably adopted, a confidence is then obtainable which ensures satisfaction to the practitioner, and also gratification to the commander. When they know that their respective ships are in the possession of health unassailed or unaffected, even by the existence of any communicable distemper, they will always be extremely circumspect against permitting any intercourse, by which such an acceptable state of health might be endangered. The remembrance of this admonition will, to the considerate, form an unfailing and invincible argument, of the suitableness and usefulness of never allowing a ship's crew to intermingle indifferently with those of other ships, or amongst the inhabitants of maritime towns, without information of their complete exemption from all infectious diseases. Convalescents returning from hospitals, and especially from those in which febrile ailments may be prevailing, should be cautiously received, and not until every suspicion of their harbouring the secret germs of disease is altogether removed. The intelligent practitioner will, moreover, institute a scientific distinction betwixt those complaints which may roundly be included under the head of transferable or communicable. This discrimination will be advantageous, even although some of these diseases should be communicated by unexpected or unintentional embarcation: and for this notable reason, that, whereas some of these are speedily conquerable by judicious management, others are obstinately pertinacious, or in some modifications of circumstances, perhaps, incontrollable. Some of these complaints, influenza, chincough, &c. for instance, will run a certain course, in defiance of all ordinary precaution or practicable opposition. This, indeed, is almost or altogether invariably the case with those diseases which are influentially transmitted through the atmosphere. An extensive proportion of even those diseases which are generally considered as contagious, or capable of producing in others successively similar affections by contact, is susceptible of interception, &c. by increase of distance or by separation. Some diseases, again, which may be transferred and communicated by the atmosphere, or by immediate contiguity or mechanical contact, may, likeways, be oftentimes interrupted in their progressive dissipation, by the intervention of even a very inconsiderable degree of remoteness. The plague, which by common consent is deemed the most poisonous and dangerous of all diseases, may be eluded by moderate distance; and while it operates in one part of a ship or house, those occupying another apartment, and especially if their station is to windward of the place of mischief, will often escape the peculiar influence of this direful malady. This conclusion is also applicable to common febrile ailment, when it hath, under an unpropitious particularity of circumstances, assumed the power of conveying and imparting itself to those in immediate exposition.

XC. In the ordinary exposure of all ships, whether of a mercantile or of a belligerent disposition, no complaint of a communicable description can ever occur, so as to excite much dread or distress. The common disorders of the variable and passing seasons, may occasionally be observeable in any climate of the habitable surface. Such disorders are depending upon causes which originate from principles generally operating, and which must commonly maintain an uniformity, which will continue as long as the relations of the causes and effects occurring in nature, are absolutely correlative and essentially immutable. Fever may be casually embarked or generated on shipboard; but where cleanness and ventilation, regularity and judiciously apportioned discipline, have their due influence, it never can be generally and injuriously disseminated, but by inattention, by want of discernment, or from the most blameable negligence. No mysterious assistance seems to be requisite; skilful treatment, separation, cleanness, and ventilation, are perfectly adequate. These proposals imply simplicity, cheapness, or the avoidance of any expensive contrivance, and, what are the most effectual and satisfying commendations, are the completeness and speediness of the advantages. Sporadic or scattered instances of febrile affection, have no right to become infectious, for they may, in general, be without much difficulty exterminated. Some other diseases, which in their nature are disposed to spread amongst those susceptible of their influence, such for example are rubeola, scarlatina, influenza, small-pox, chincough, &c. are more difficultly, if some of them be practicably, restrainable. The prevention of their introduction, therefore, is, when within the grasp of possibility, the plan, undoubtedly, the most commendable, and conclusively the most advantageous. For, after the admittance of some such distempers, their subjugation as long as they have subjects to work upon, will, in the present condition of knowledge, be nearly or sometimes impracticable. But albeit, the foregoing assertion is a point, or critical *article*, upon which it is the safest mode that the applicable determination should revolve; yet some of the forenamed distempers may, at their commencement, or first evolution, be almost immediately circumscribed in their action, and forthwith overwhelmed or suppressed.

XCI. The seemingly dreadful catalogue of infectious complaints, in the estimation of the intelligent, courageous, and philosophic practitioner, dwindles into a compass which is comparatively inconsiderable. With the exception of a moderate number, they are all, when under the gubernation of prudential and energetical management, for the most part easily conquerable. Plague and Yellow Fever, &c. have lost, and will continue to lose, much of the terror which they formerly struck into mankind. As mentioned before in the course of these notes, it hath remained, (and still remains amongst some,) till very lately, a question, whether even Pestilence or the Plague itself be infectious! If it is not an infectious distemper, it certainly cannot be denied that it possesses a highly pervading influence. A horrible and unhappy, and even injurious discrepance of opinion, hath prevailed about Yellow Fever; and still, after all the nonsense which has been thrown out on the subject, the matter is not hitherto properly determined. The complaint is not understood, neither in its natural history nor in its treatment. The following statement may be introduced, as illustrating and confirming this latter conclusion.—"You may guess how much I dislike the West Indies; and I draw cause for my dislike from the misfortunes of the ship I now command, which in a month, or six weeks, lost three lieutenants, nine midshipmen, and near three hundred seamen.—They died of what is called the *yellow fever*. In short, if a man was sick, it could be nothing else; or could he have any other medicine than what was administered in that fever, which was calomel, nothing else; no preparation; but the moment the patient complained, whether it was pain in the head or the rump, it made no difference; and to this day they persist in killing ninety-nine out of the hundred by mercury, &c." Although this was communicated by a gentleman not regularly belonging to the profession, yet as being legitimately and graphically applicable, it is therefore allowable as presenting a true but mournful picture, the consequence of ignorance and perverseness. And, what applied at the date of this declaration, still applies to modern practice in a modified degree, even till this day, and that without extenuation or reservation. The same, or similar reasoning, seems to apply to the Plague in all its circumstances.

XCII. In the present state of information and human science, the following is perhaps the safest remark on the general subject: That it is only by a concentration of the evils, and the opportunity afforded to their aggravation and continuation, by unduly crowded population and other unfavourable circumstances, that Plague hath spread such alarm and calamity, and especially in those countries in which it may be said to be indigenous. Conclusions of nearly equipollent importance, are applicable to the principal circumstances of Yellow Fever, considering it as a complaint either of an infectious disposition, or engendered by a particularity of circumstances in some situations, and afterwards causing particular phænomena in those who are susceptible of the morbific influence of such circumstances. All these diseases, by dilution (if the expression is allowable) of their respective miasmata, (no matter what these latter may be in their essential constitution, if they are productive of specifical phænomena,) like acids and alkalis, when much reduced by the addition of aqueous liquids, become at last almost imperceptible, and their peculiar and positive action, or power of action, is wrought down to insignificancy. Upon these principles, along with the consideration of the true state of their respective constitutions, the difference of the violence of the same disease as influencing individuals, will in some measure be explicable. The marine surgeon, in the course of his practice, will meet with much more difficulty in the treatment of some complaints, which in all probability have hitherto engaged little of his attention, than in that of those distempers which he has been led to believe were invariably so formidable.

XCIII. A consideration of remarkable importance should be observed, upon receiving men in a state of convalescence from hospitals; whether their bodies and all their appertenances are sufficiently clean before their readmission on shipboard. This precaution is especially necessary, if they are capable of either infecting directly by means of their own complaints, or by a circumstance, which in ordinary estimation is of a less suspicious description, whether or not they may have been exposed where infectious disorders were predominant. From inattention to such circumstances, infectious disorders have frequently, extensively and perniciously been disseminated amongst ships' companies, and by this unsuitable management have afterwards produced more inconvenience, than all the good which hath been received from the assistance of hospitals, even collectively comprehended. An impropriety also formerly subsisted, (or even at this day subsists,) of sending what disorders, &c. were deemed troublesome, or frequently cases presenting no particular difficulties, to hospitals; but progressive improvement hath sufficiently demonstrated, that this practice prevailed in a degree injurious to the Public Services, and certainly derogatory to professional knowledge. It will be found, that an indolent and a roguish sailor is a vexatious and pestilent creature in an hospital, as well as on board his own ship; and the loss to the Naval Service, by the indiscreet commission of seamen to hospitals, has been prodigious. Another argument of material interest upon such occasions, is the conviction with all men qualified by observation and enlightened understanding, that most examples of disease will succeed as well on shipboard, as in any other situation. This conclusion necessarily presupposes a concourse of favourable circumstances, the enumeration of which would here be unnecessary, and especially after all the foregoing disquisitions. Some exceptions to the sweeping influence of general arguments do undoubtedly intervene. The instances to be excepted must be judged of by the medical men in attendance, and the determination must be taken from the nature and condition of particular cases, and from the state of accompanying circumstances; but the complete discussion of all the necessary distinctions cannot at present be attempted. The transmission of many to hospitals hath been the expedient and conclusion of professional laziness, inaptitude, and ignorance; but latterly, marine practice, probably, does not deserve to be so particularly reprimanded.

XCIV. The following, however, seems a legitimate and applicable conclusion, that it is a mistaken method in conducting the practitioner's department, to send so many cases, and often without suitable distinction, to hospitals. As this subject has previously been adverted to, the matter needs not be much further prosecuted. It may be remarked, that in a ship which is spacious, clean, properly aired, under the governance of enlightened and judiciously regulated discipline, &c. the ordinary run of diseases may be managed and removed as completely and speedily as on shore; and this purpose can apparently be accomplished with less expense to government. The industrious, scientifical, and conscientious practitioner, has a satisfaction in having all his men, when indisposed, under his immediate observance and management. He is thus familiarly acquainted with every concomitant of their complaints, with what phænomena these may occasionally be complicated, and whether they be uncommon or exhibit nothing extraordinary; and, moreover, he will become acquainted with those occasional modifications, which are the consequences of constitutional idiosyncrasy, or which may be superinduced by other circumstances. If the men are honest, steady, and reconciled to their services, when they find that their medical officer hath an anxiety for their welfare and recovery from disease, confidence will become reciprocal, and thus the best means will be constituted, betwixt the obedience of the common sailors and the practical assiduity of the surgeons, for the maintenance of healthiness. Another consideration of particular importance to the medical officer, and eminently interesting to the Public Service, is the propriety of his knowing what confidence may be placed in their apparent, or rather absolute restoration. This immediate and valuable knowledge, the acceptable offspring of his autoptical observation, and the consequence of his own commendable management, introduces a satisfaction and firmness of determination concerning the actual condition of health, and physical strength of a ship's company, (that should be exclusively in his professional superintendance,) which are not obtainable when part of a ship's company is sent to hospitals, without the applicable and commendable discrimination.

XCV. The indiscreet and promiscuous mode of sending seamen to hospitals, hath too frequently afforded opportunity to the audacious practice of villanous imposition; and thus, by an ingeniously counterfeited management, they have obtained their desireable intention—a complete dismission from employment. The following quotation will exemplify and illustrate what hath been here asserted: "The Pseudo-rheumatism is, for the most part, confined to the loins; and to strengthen the pretension of being objects for invaliding, an incontinence of urine is said to accompany it. A person who has been accustomed to hear their narratives, may easily distinguish the real from the assumed disorder: the tale is seldom contrived with address, and it requires but a slight cross examination to detect the incongruity of its materials. Yet, obstinacy from disappointment will occasionally carry them to great lengths in their perseverance; and the fictitious complaint sometimes becomes a fatal disease. The application of copper to their sores has killed many. These deceptions also afford them opportunities for making their escape from the hospitals. I have known a man, that for two or three months had never been known to raise his head and shoulders beyond an angle of forty-five degrees, with the rest of his body; yet when he found his purpose fit for execution, would get over the hospital-wall and make his escape." This statement alone would seem to constitute a sufficient argument against the impropriety of sending common sailors to hospitals, unless such procedure should be indubitably dictated from principles of humanity and necessity. The applicable management of this part of the business will be accompanied with considerable difficulty, not only to the medical men, but also to those who are officially concerned and interested. In harbour, and in a ship of sufficient amplitude, and in possession of all the agreeable requisites, such as cleanness, regulated ventilation, &c. and, as sometimes necessary, judiciously applied medicinal assistance; every thing adviseable for the sick can be procured. And thus, excepting some infrequent examples, in which the complaints may prove lingering, or be otherways troublesome from complication or other unfavourable circumstances, or may imply in their nature something, or may require something in their treatment which demands steadiness or tranquillity; those indisposed should generally be under the superintendance and administration of the accustomed practitioner. When a medical man parts with some of those who should naturally and properly be under his charge, he may apparently lessen his labour and responsibility; but such considerations can never be admitted as extenuating the impropriety of his management; and such conduct seems to constitute one mode of undermining the service which should receive his most vigorous and faithful encouragement. The commander, therefore, who should be naturally interested in the welfare and strength of his ship's company, may consider himself most fortunate, when he finds his friendly labours for the Conservation of the Healthiness of his men, collaterally and powerfully seconded by the assistance of an illuminated and discerning practitioner.

XCVI. The management of all the means contributive to the Preservation of Healthiness, and the suitable or innocuous adaptation of remedies to the Removal or the Mitigation of disease, constitute among mankind considerations of the most particular importance. The possession of unimpaired healthiness will be reasonably accounted one of the most agreeable temporal blessings. If the wealthy and luxurious are so commonly careful about the possession of ease and of freedom from sickness and suffering, how much more cogent, it might be imagined, would such an inclination be with those, who must depend upon manual labour for subsistence. If the Wealth of a Nation *radically* depends upon the quantity of *actual Labour* and the *effectual produce*, so a consideration of invincible importance, and naturally pregressive to these, must be the possession of a sufficiency of Healthiness. This is a leading and constituent principle of usefulness; and without the unassailed agency of which, the quantity of actual Labour, and consequently its productiveness, must suffer a proportional infringement. This fundamental consideration might have formed a regulating principle with the intelligent author of the

"Wealth of Nations;" but it perhaps did not enter into his contemplation, although otherways luminous and comprehensive. If the prosperity of a country naturally depends upon its labour, and this latter upon the *actual condition* of *health* and its congenerous companion, *strength;* and if this powerfully and generally operating principle applies to common life; how much more virtually does it apply to the commercial and defensive interests of a country, whose existence, in the scale of nations, depends upon their uninterrupted maintenance! An interchangeable communication, and reciprocal dependance, seem continually to subsist betwixt these two great branches of Public Service, and both contribute proximately or indirectly to the support and protection of the commonwealth. The whole Constitution must be viewed as a skilfully contrived machine, naturally and essentially depending upon the completeness and correctness of all its parts;—and as it approaches to perfection, so will be the commodiousness and serviceableness of its accomplishment.

THE END.

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